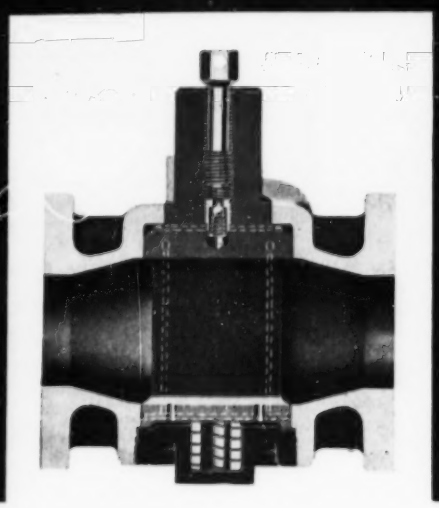
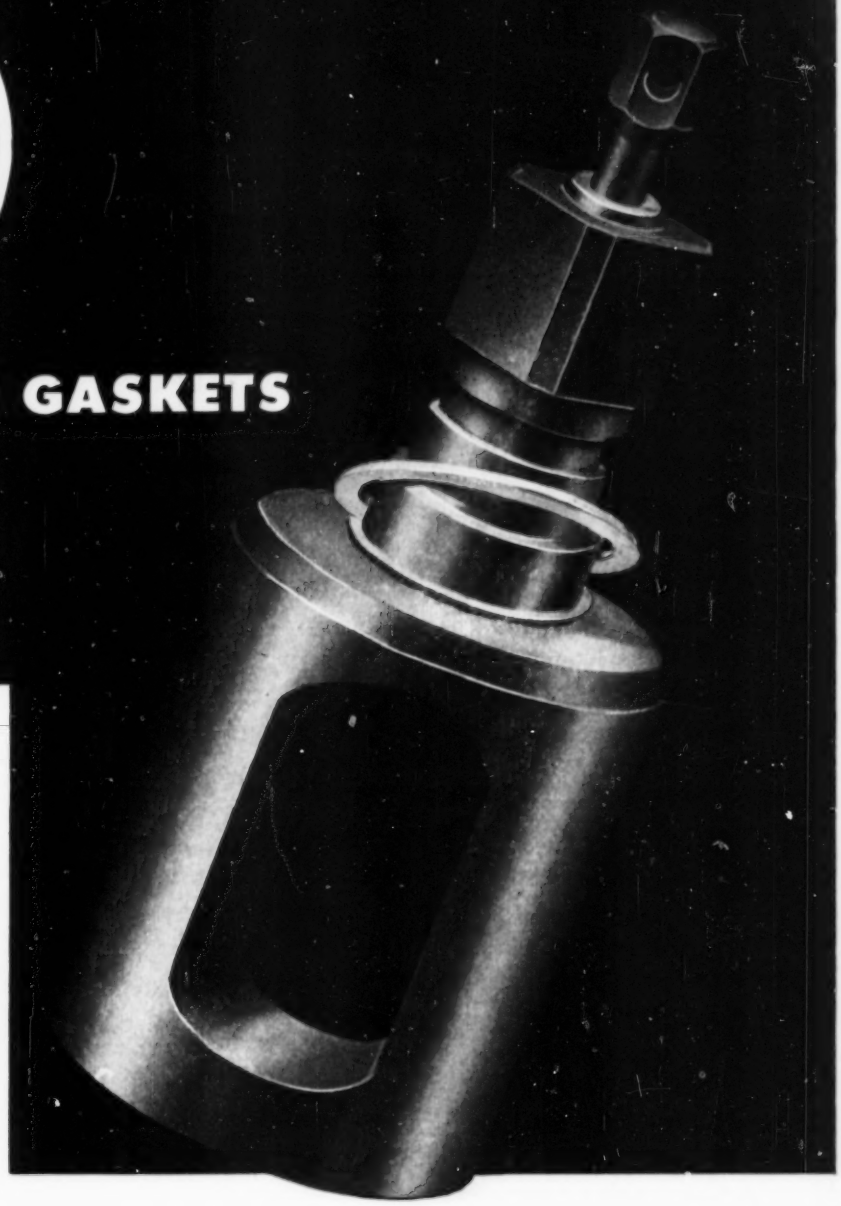
TEFLON GASKETS





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30th Year of Publication

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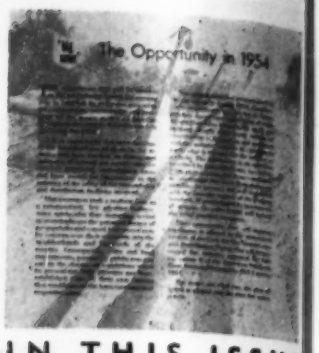

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The "big news" for pipeline men in 1954 is the presentation of the new code for pressure piping; and the big job ahead is to give the subcommittee every ounce of help needed to see that it wins acceptance (see page 89 et seq.)

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Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

Business is good and will get better

Annual year-end reports from AGA (in this issue) and GAMA reflect well-founded optimism for 1954. Gas sales, revenues, customers, reserves, storage are at all-time highs, and the market is far from saturated. House-heating customers will continue to be added at a rate in excess of 1 million per year. While well behind 1951's magnificent records, sales of base load appliances were substantially ahead of 1952. LPG sales were up, as well, showing overall a better-than-10% gain.

Utilities continue to spend

At year's end, gas and electric utilities were continuing to show the way among U. S. industries in capital investment. For 1953, $4.5 billion was spent, compared with $3.8 billion for 1952; and the Department of Commerce foresees a budget for the new year that will approximate that of the year just concluded. For the first quarter, just over $1 billion will be spent, as compared with 1953's first quarter outlays of $904 million. Although gas utility spending has throttled down ever so slightly, electric companies are expected to show gains to more than compensate.

El Paso's attempt to drop common carrier schedules barred

FPC has suspended El Paso Natural Gas Co.'s notice of cancellation of common carrier rate schedules, pending hearings. Advised by the Interior Department that, under the newly amended Mineral Leasing Act, the company is no longer required to post common carrier schedules, El Paso had earlier sought to drop the schedules, but FPC held that the action had not been shown to be justified, and may "result in the making or granting of an undue preference or advantage to some or the subjecting of others to an undue prejudice or disadvantage . . ."

In Britain, competition is back again

For the first time in 15 years, electric generating facilities are said to be catching up with demand, and the competition is starting to campaign for electric cooking. Gas had its way in the field too long, and the British cooker manufacturers are reported to be in for a real competitive battle.

PAD to expire by March

Petroleum Administrator J. A. LaFortune expects to close up shop in the next two or three months, at which time a reactivated Oil & Gas Division of the Interior Department will take over.

New Mexico eager to export its gas

No lesser personage than the director of the New Mexico State Oil Conservation Commission is plugging for export of gas from the state "before it becomes an obsolete fuel." Richard C. Spurrier, testifying on behalf of the Pacific Northwest application to transport San Juan basin gas to Seattle and environs, said he favored export to develop the producing area and increase state revenues. Over 20 years, said the conservationist, Pacific Northwest would take 7 MMcf, but since reserves have gained 11 trillion ft, 4 trillion will be without a market.

Alberta is actively pushing for export, too

Premier Manning last month proposed a consolidation of the plans of two pipeline companies that wanted to take gas eastward, and included in the scheme a branch line to the U. S. border which would tie in to a proposed Northern Natural line. He went on record as wanting international export for the rich potential market offered. The premier also has given favorable consideration to a plan to export gas from Pakowki lake field in southern Alberta to Montana. Canadian-Montana Pipe Line Co. would be the carrier, drawing from a 334 billion-ft surplus in the area.

An Eye on the Capital

The same old bills in '54

Congress, meeting against a backdrop of international tension and a domestic political situation that seems quite tenuous for the Republicans, will consider (although it may not finally act upon) a wide variety of matters of great interest to the natural gas industry in this, its second session.

First and foremost among these important matters, of course, is likely to be a renewed effort by Congressmen from gas-producing states to pass legislation similar to the old (and now-famous) Kerr Bill. This legislation (H.R. 2120) was introduced in the first session by Representative Lyle (D.-Texas). The Kerr bill passed the Congress but was vetoed by former President Truman.

Mr. Lyle's bill now is in the House Committee on Interstate and Foreign Commerce. Unless—as is more likely—some other Congressmen introduce legislation, the Lyle bill possibly will be used as a basis for amendment and early action, probably with bipartisan support.

The renewal of interest in this naturally stems from the U. S. Supreme Court decision refusing to review the so-called Phillips case, which means that now the Federal Power Commission *must* fix rates for interstate sales of natural gas by companies that produce and gather it, although it is plain that

Thermally Thinking

the FPC did not want such authority. The Circuit Court of Appeals had made the ruling, which the Supreme Court in effect upheld (see later item for other ramifications).

Another matter of vital interest to the natural gas industry in the second session will be that of tax revision. You'll hear—and see more about taxes all the time, from here on out. There's a real fight brewing between the administration and crochety Rep. Daniel Reed (R.-N. Y.), chairman of the tax-writing House Committee on Ways and Means, who is no slouch when it comes to throwing monkey wrenches in machines that try to run over him.

The once-postponed decrease in both individual and corporate taxes (including excess profits rates) has taken effect, as scheduled, as have the increases for the employee and employer social security payments. However, the administration already is seeking new sources of revenue, while Congressmen generally are thinking in the same terms as Mr. Reed—cutting taxes even beyond the Truman-scheduled decreases. In the melee, it's possible that the depletion allowances will be increased (although some labor organizations plug perennially for decreases in these allowances), that a more liberal depreciation policy on utilities will be allowed, and that double-taxation of dividends may be eliminated.

The Hinshaw bill (H. R. 5976), which would exempt intrastate distributors of gas from FPC control (in order to overturn the Supreme Court's East Ohio decision of some years back) already has passed the House of Representatives and has been approved by the Senate Committee on Interstate and Foreign Commerce. It likely will pass the Senate, but only after plenty of popping off.

Another bill is designed to standardize rent requirements on federal lands for oil and gas production. Renters would have to pay second- and third-year rent, as well as the first year's, according to H. R. 335, reported by the House Committee on Interior Affairs. It is explained in House Report No. 563.

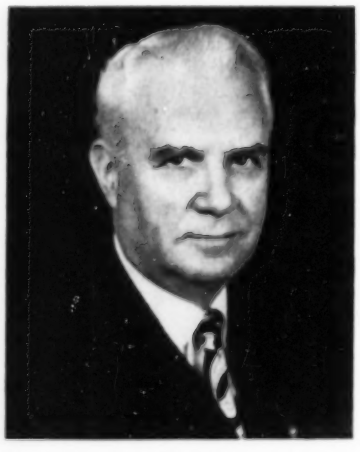
Another bill, S. 525, would give natural gas companies the right of eminent domain. This was introduced originally in the House of Representatives by Rep. John Heselton (R.-Mass.), and hearings on this and other bills to amend the Natural Gas Act were held last spring. Surprisingly, there was no opposition, but the bills still are in committee.

H. R. 134, also introduced by Representative Heselton, gives the FPC authority to prescribe safety requirements for natural gas companies. This, too, has been the subject of hearings, but has not been reported. It may be in this session.

H. R. 1282, introduced by Rep. Morgan Multer (D.-N. Y.), would give the President power to declare a "fuel emergency," in case of a national crisis (H-bombing, strike, etc.), and, during such a period, Uncle Sam would be able to control and allocate fuels, such as natural gas, coal, etc., wherever and whenever federal administrators thought wise. This is still in the Committee on Interstate and Foreign Commerce and no action has been taken on it so far.

FPC not ready to spread its wings

The most significant single angle to the famous Supreme Court refusal to hear the Phillips Petroleum Co. case (thus making the U. S. Circuit Court of Appeals for the District of Columbia decision the law, in this instance) is that the FPC officials were distinctly surprised by the ruling, and, in fact, utterly unprepared for the inevitable follow-up they must carry out.



Sen. John W. Bricker, in his role as new chairman of the Committee on Interstate and Foreign Commerce, may hold the key to success of remedial legislation to free producers from FPC jurisdiction.

The FPC is not likely to move very hurriedly, although it is under mandate to fix rates for Phillips. The commission faces a very important and burdensome field of jurisdiction, at the very time its treasury is being trimmed by the Bureau of the Budget.

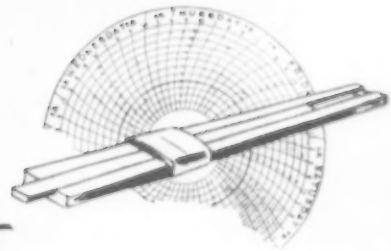
Its first step probably will be to start a series study of natural gas production and gathering operations. In the meantime, a sort of holiday order, permitting independent producers to continue charging present contract rates until specific order of the commission, likely has been, or will be issued. Filing requirements on such contracts and other data will be promulgated in due course. This all will take time and give Congress an opportunity to act if it *will* act.

The chances for corrective legislation in the politically-sensitive year of 1954 will depend on many things and many men, important among whom is Sen. John W. Bricker (R.-O.), new chairman of the Senate Committee on Interstate and Foreign Commerce. Senator Bricker has been notably silent on his views regarding the practicality of Congress passing a "new" Kerr bill, but it should be kept in mind that he has been very sympathetic to natural gas interests and, in fact, to the privite utilities generally, for many years.

In fact, he voted for the Kerr Bill several years ago and he may even come out forcefully in favor of similar legislation. On the other hand, as the number of gas consumers has increased by leaps and bounds throughout the Middle West, there has been a gradual shift in the thinking of some Congressmen who voted for the Kerr Bill. They now see that propagandists have persuaded millions of these gas consumers to think that the only way prices can be kept low is by FPC regulation of the gas producers and gatherers. This subject is one that lends itself to demagoguery, as has been evident for some years, and when people are misled in their thinking, even this fact has to be taken into account by politicians who want to keep their seats, no matter what their personal views.

Continued on page 70

Technical Trends



* By GUY CORFIELD

NBS-AEC cryogenic engineering laboratory

The National Bureau of Standards and Atomic Energy Commission have jointly established what is termed a major low temperature engineering facility, including a liquid hydrogen plant and cryogenic* laboratory at Boulder, Colo. This laboratory, erected on a 210-acre site at a total cost of $3½ million, has a staff of 60 people and makes possible large-scale production of liquefied gases in sufficient quantity for laboratory and industrial equipment development and testing at temperatures near absolute zero. At very low temperatures the behavior and properties of materials often undergo very marked changes, developing problems of design and construction that cannot be foreseen or extrapolated from known data at higher temperatures; for instance, construction steels become brittle, rubber loses elasticity, and the mechanical properties of plastics are greatly altered. Such research is, of course, of great interest to the gas industry in connection with such problems as liquefied gas storage and nitrogen removal.

The installation consists of three general units, a liquid hydrogen plant, a liquid nitrogen plant and a group of laboratories, with a total of 34,000 sq ft of floor space.

Liquid hydrogen is the lightest of all liquids, having a density only 1/14th that of water. It boils at atmospheric pressure at a temperature of —253°C (—423°F). Commercial hydrogen gas is brought to the plant in tube banks at a pressure of 2400 psi. It is then put through successive stages of purification, cooled to liquefaction by both heat transfer and expansion, and transferred through vacuum insulated lines to vacuum jacketed storage.

Liquid nitrogen, with a boiling point of —196°C (—321°F) is produced both for its own use and as a means of cooling in the liquid hydrogen process.

Many safety devices are installed. An automatic hydrogen gas indicator, taking samples at eight different points, sounds an alarm if combustibles in the atmosphere rise above 10% of the lower explosive limit, and actuates a ventilation system creating complete air change every two minutes; floors are electrically conducting, to minimize the build-up of static electricity charges; and there is an automatic check for oxygen in the hydrogen, with a sensitivity of two parts per million.

Oil production by underground combustion

In previous issues of this page the developments in underground gasification of coal have been described, and mention has also been made of several methods of producing the oil remaining underground after normal flowing and pumping; in this latter connection it is estimated that the so far unrecoverable domestic oil exceeds 4 billion bbl. A process is now being actively explored, which includes elements of both the above procedures; namely, the application of heat to the reservoir, by "in situ" combustion, to both expand the oil and increase its mobility by decreasing its viscosity.

The experiments, which have been conducted by Magnolia Petroleum Co. both in the research laboratory and later in a southern Oklahoma field, consist essentially of starting combustion at the bottom of a selected well by means of an electrical resistance type heater enclosed in a 4-in. x 34-ft stainless steel tube lowered into a 7-in. slotted liner, and simultaneous air injection. Combustion proceeds in a slowly widening and advancing high temperature front, heating the adjacent strata to promote flow of hydrocarbon gases and oil from nearby wells that were formerly nonproductive.

Gas maintains safe record

As in past years, the National Fire Protection Assn. has issued an analysis of fires during the preceding year, and their NFPA Quarterly of October 1953 carries an article entitled "Fires and Fire Losses Classified, 1952". Table VII, "Estimated Distribution of U. S. Building Fire Losses by Causes, 1952", summarizes the data in a comparative manner.

The total number of fires was 703,000 at a total cost of $793,500,000. Of interest are the items shown in *Table 1*. Note particularly the heating and cooking equipment item.

As has been previously remarked it is amazing, and a tribute to the gas industry, that a product that depends on *flame* for its utilization is so safe in comparison with competitive services.

TABLE 1.

	Number of Fires	Losses
Defective or overheated heating and cooking equipment:		
Oil fired equipment	36,000	$32,700,000
Gas fired equipment	**4,800**	**4,360,000**
Other and unknown	39,200	35,700,000
Gas and appliances, including gas explosions	**8,300**	**9,050,000**
Electrical, fixed services, fires due to misuse, faulty wiring, equipment	55,000	75,800,000
Electrical power consuming appliances	30,500	16,700,000
Hot ashes, coals	12,300	13,700,000

*Cryogenic, from the ancient Greek word kryos, icy cold, is an adjective or adverb meaning very cold or at very low temperature.

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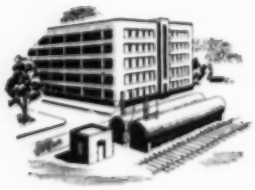

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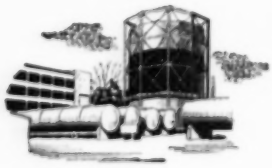
For Utilities



What advantages does Philgas offer utilities? Again . . . Philgas can be depended upon as a superior, reliable product . . . clean-burning and uniform in thermal values and gravity. Many progressive utilities find it profitable to augment natural or manufactured gas with Philgas. Automatic operation cuts down overhead.

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WHAT'S THE "big news" FOR 1954?

1954 is a year of opportunity in the gas industry. Leaving behind another record-breaking year, utilities have major challenges to meet—challenges which are in truth opportunities for new growth, and new stature.

1953's records point the way to new highs in 1954 36

LPG, the industry's fast-growing ally, showed a 10% gain 40

Plastic piping is now being used or tested in 46 utilities 42

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IGT research is finding promising methods of making substitute gases 46

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Development program holds key to tomorrow's gas growth . . . 53

A new pipeline code is nearly ready for industry approval 89

"big news"

Industry's steady climb continued in '53; strong gains in '54 predicted

By **EARL H. EACKER** • President, American Gas Assn.

THE gas industry in 1953 maintained its position as one of the fastest growing industries in the nation. Paced by the continued expansion of its natural gas systems, the gas utility industry achieved new records in number of customers served, in volume of gas sold and in total revenues from the sales of gas. Reserves of natural gas achieved new high levels and the gas industry's expansion program is scheduled to continue for several years. There is every reason to predict that 1954 will be another banner year, with still greater records achieved. The outlook for the industry is very promising for many years ahead.

Gas utilities have been adding customers at the rate of approximately 800,000 a year. Natural gas transmission systems have pushed forward into new areas. Additional lines are bringing more natural gas into regions now served by natural gas. Natural gas reserves rise each year, in the face of record production.

Today the gas industry has more than $11.5 billion invested in plant and facilities, with total capital assets of more than $13.3 billion. During 1953, about $1.2 billion was spent by the industry for new construction and in expanding present facilities to meet the ever-increasing demand for gas service.

The American Gas Assn. estimates the industry will spend more than $3 billion in the three-year period from 1954 through 1956 on new construction and plant expansion. Nearly $2 billion of this total will be spent on natural gas transmission lines and $1 billion will go toward increasing present distribution facilities of gas utilities.

Much of this expansion effort is a result of tremendous advances made by the natural gas branch of the gas industry. Natural gas customers have increased more than 150% in number since 1940 while the volume of natural gas sold by utilities and pipelines has gained 235% in the same period. Many of these natural gas customers are on lines of gas utilities converting from manufactured or mixed gas distribution to natural gas. Many others are new customers in areas being served with gas for the first time.

Facts and figures

The gas utilities served approximately 27.2 million customers at the end of 1953, including about 300,000 L. P. gas customers served directly by gas utility companies. This was a gain of about 800,000 customers, or about 3% over the more than 26.4 million customers, including 300,000 LPG customers on gas utility lines a year earlier. In addition, some 6.5 million customers are served with LPG in areas not located on gas utility mains. This is a new record for gas utility customers.

More than 20.6 million were receiving natural gas at the year-end, a gain of 6.5% over the previous year. More than 18 million of these natural gas customers were residential customers using natural gas for cooking, water heating, househeating, refrigeration, or one of the other domestic uses of gas.

Manufactured and mixed gas customers, largely as a result of conversions by important gas utilities to natural gas distribution, decreased to total about 6.3 million. This was a decline of 6.8% under the 1952 total.

Total sales of utility gas in 1953 amounted to 56,948 billion therms, a new high level, representing a gain of 8.1% over the previous year. Natural gas sales also made a new high at 53,563 billion therms, a gain of 8.7% over the 1952 record high. Manufactured and mixed gas sales were about 3290 billion therms, down 1.0% under 1952.

Revenues from sales of gas in 1953 reached a new record high of $2,741,

899,000, a gain of 11.1% over the previous record of $2,467,284,000 in 1952. Natural gas revenues increased 15.7% to total $2268 billion, also a new record. Manufactured and mixed gas declined about 7% to total $452 million.

Transmission line growth

More than 8000 miles of new pipeline was approved by the Federal Power Commission last year for the natural gas industry. About 5000 miles of pipeline actually were laid in 1953, with nearly 3000 additional miles just starting or under way at the year-end. Applications for several thousand miles of additional natural gas pipelines awaited commission action at the end of 1953.

At the end of 1953, the nation's utility and pipeline network of gathering, transmission, storage and distribution lines for natural gas were estimated at more than 394,000 miles, enough to circle the world 16 times. With the distribution systems of manufactured and mixed gas companies totaling another 50,000 miles, the gas industry's total pipeline mileage of about 445,000 miles constitutes one of the greatest transportation systems in the nation.

The gas industry will spend approximately $100 million before the end of 1956 to increase present capacity for underground storage of natural gas. At the end of 1952 there were 151 underground storage pools in operation in the United States with an estimated capacity of 1290 billion cu ft. In 1953, 17 additional underground storage pools were under construction which will add about 282 MMcf capacity to the underground storage facilities of the nation.

Natural gas was delivered in greater volume last year to Massachusetts, New Hampshire, and Connecticut, augmenting supplies of cities such as Boston, New Haven, and Hartford. Rhode Island received natural gas for the first time in 1953. Nevada also expects to have natural gas for the first time by the year-end. A proposed extension of a present line would bring natural gas to Maine. This will leave Vermont as the only eastern state not receiving this popular fuel.

Several new lines will be constructed within the next two years. The American-Louisiana Pipeline Co. will build a 1200-mile, 30-in. transmission line costing $130 million from Texas and Louisiana to Michigan. A line of nearly 900 miles to be built by the Gulf-Interstate Co., will bring more natural gas to the Appalachian region from Louisiana. Two companies have declared their intentions of bringing more natural gas to the New York, Philadelphia, and Newark metropolitan areas.

"Rejuvenated" is the word for the gas industry as it swings into 1954, according to Earl Eacker, president of AGA and of the Boston Consolidated Gas Co.

Natural gas reserves ample

Proved recoverable reserves of natural gas continue to be more than ample to supply the constantly increasing demand. The AGA committee on reserves estimated at the beginning of 1953 that reserves of natural gas were 199.7 trillion cu ft. This was an increase of 5.9 trillion cu ft over estimated reserves a year earlier, in spite of a record production in 1952 of 8.6 trillion cu ft.

Each year since official estimates have been made, new discoveries and expansions of previous estimates in known fields have more than offset the tremendously increased production of natural gas. New discoveries alone in 1952 added about 5.4 trillion cu ft to the nation's reserves. This compares with 3 trillion cu ft added by discoveries of new fields in 1951, indicating a considerable increase in drilling and exploration by producers and wildcatters.

Gas househeating in demand

The gas industry added 1,090,000 new gas househeating customers to its lines during the 1952-1953 heating season. This brought the total of residential gas househeating customers to about 11,750,000, the AGA estimates. The gas utility customers expect to add another 1,221,000 new gas househeating customers in the 1953-1954 heating season, and nearly 1.2 million more homes will get gas househeating in each of the two succeeding heating seasons, as increased supplies of natural gas are brought into areas where the gas househeating demand still exceeds the utilities' ability to serve these prospects.

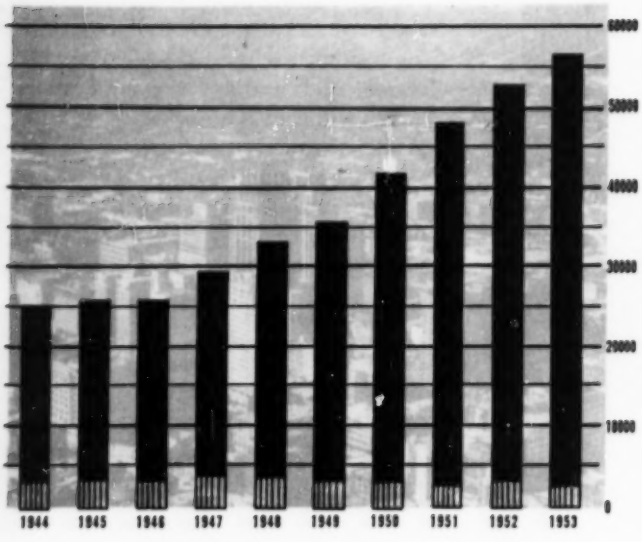
Gas appliances

Estimated sales of gas appliances indicate an increase over 1952. Sales in the first half of the year were excellent. In keeping with other types of appliances, range sales declined in the second half, but still maintained a lead over the previous year. An estimated 2,250,000 gas ranges were sold in 1953, compared with 2,175,000 units sold in 1952. Approximately 2,150,000 automatic gas water heaters were sold in 1953, compared with 1,910,000 units sold the previous year. Estimated sales of central gas heating units last year totaled 820,000, an increase of nearly 100,000 units more than sales in 1952. Gas conversion units also registered a considerable gain over the previous year. Sales of gas refrigerators, as well as those of automatic gas clothes dryers, all-year air conditioning units and gas incinerators, moved ahead of the previous year, under the impetus of increased promotional effort on the part of the entire gas industry.

Conclusion

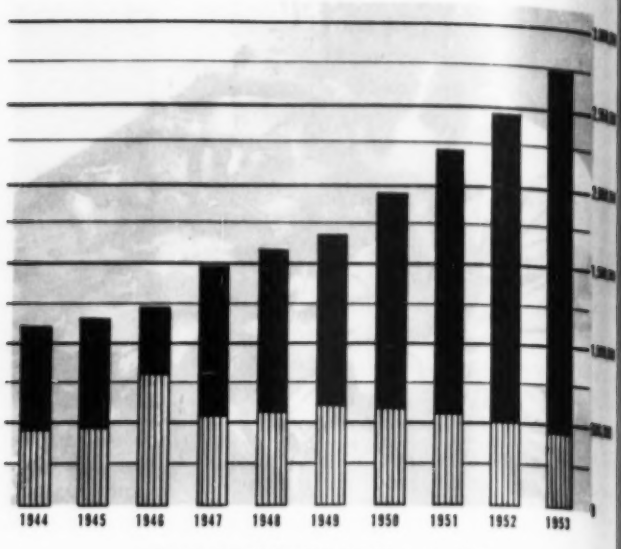
A rejuvenated gas industry is moving swiftly along the path of progress. Natural gas lines continue to extend into new territories and to bring additional supplies to areas already served with natural gas. A favorable regulatory climate holds encouragement for fair rates of return on the billions of dollars invested in gas properties. This will mean increased investor confidence and helps assure the necessary capital for the great construction program still ahead of the gas industry. Competition is keen, but an alerted and integrated gas industry has launched a development program, backed by increased promotion, advertising and research funds to maintain and increase the competitive position of gas and gas appliances. With all these favorable factors at hand, the future of the gas industry is most promising.

Inventory of the gas industry hits new peaks →



GAS SALES (In Millions of Therms)

NATURAL OTHER

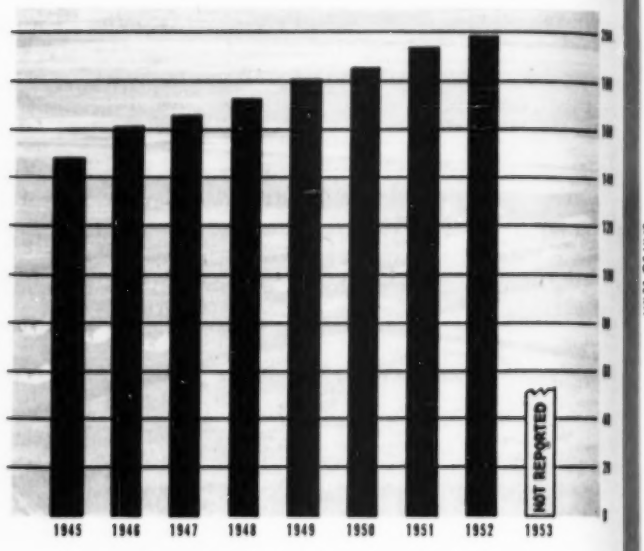


GAS REVENUES (In Thousands)

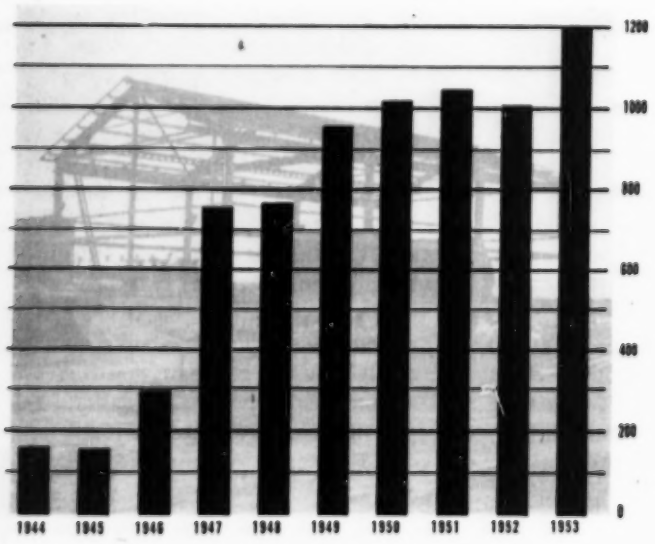
NATURAL OTHER

Inventory of the Gas Industry

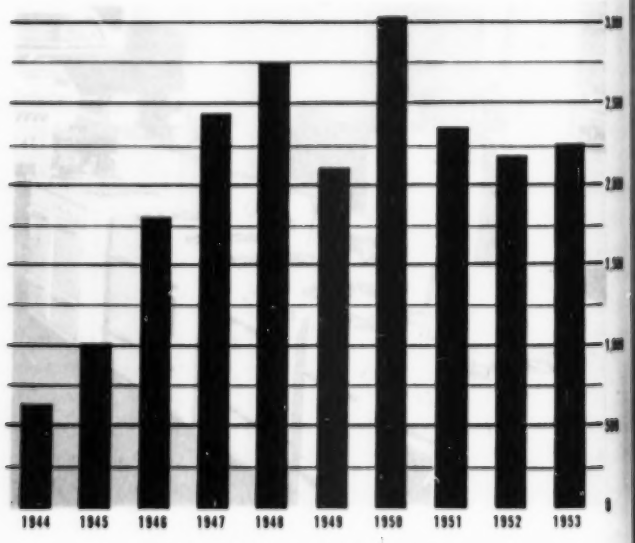
DECEMBER 31, 1953



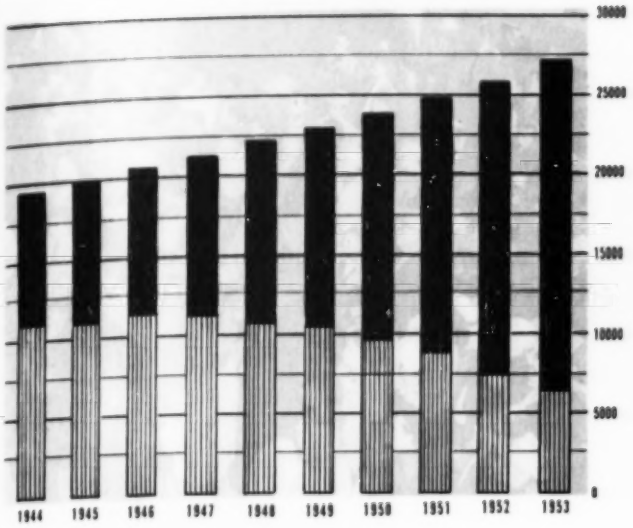
GAS RESERVES (In Trillions of Cubic Feet)



CONSTRUCTION EXPENDITURES
(In Millions of Dollars)

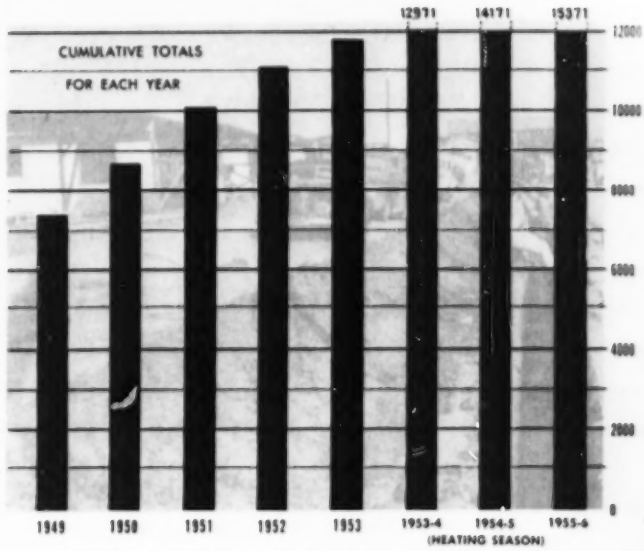


GAS RANGE SALES (In Thousands)

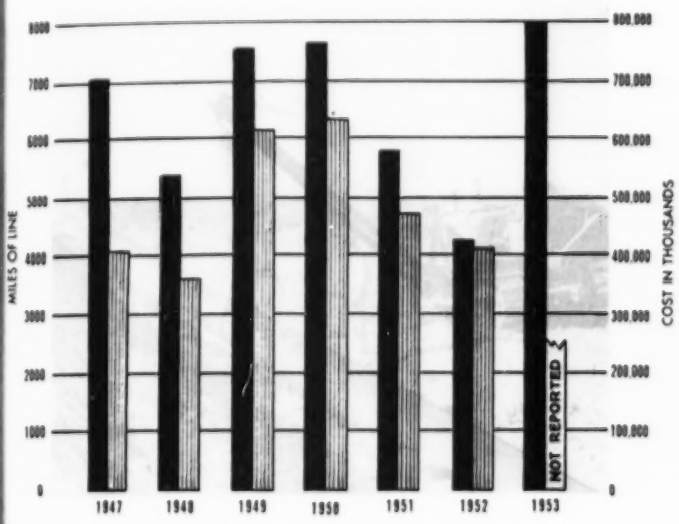


GAS CUSTOMERS (In Thousands)

NATURAL OTHER

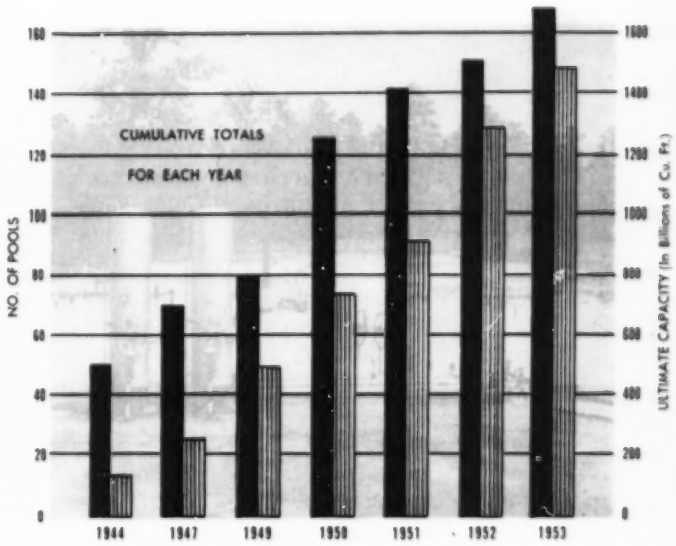


HOUSE HEATING CUSTOMERS (In Thousands)



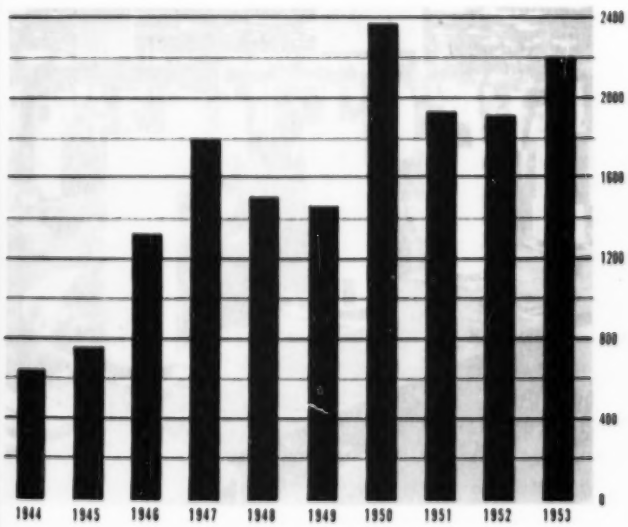
MILES OF GAS TRANSMISSION PIPELINES

MILES OF LINE COST IN THOUSANDS

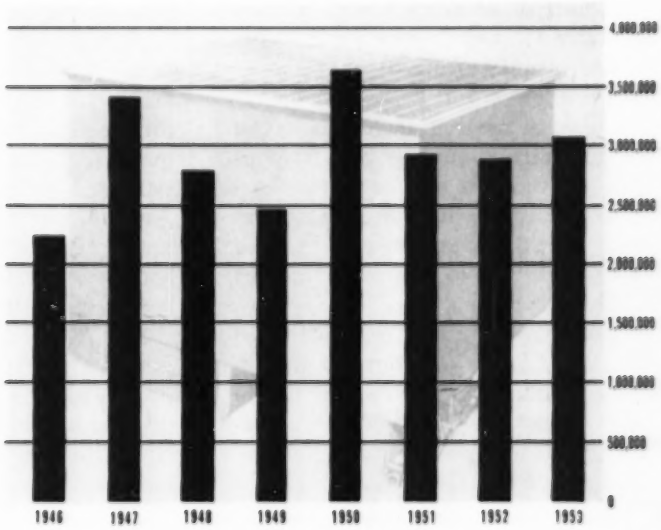


GAS IN UNDERGROUND STORAGE

NO. OF POOLS ULTIMATE CAPACITY



GAS WATER HEATER SALES (In Thousands)



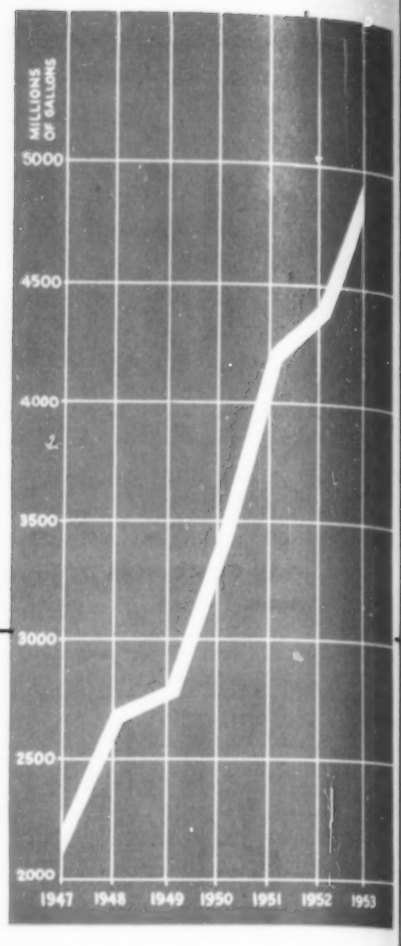
GAS HEATING EQUIPMENT SALES

ALL TYPES.

"big news"

LPG racks up 5 billion-gallon sales in 1953

• By GEORGE R. BENZ and PAUL W. TUCKER
Phillips Petroleum Co., Bartlesville



SALES of liquefied petroleum gas approached a new volume milestone in 1953 with a healthy gain over 1952. Outlook for 1954 is for greater emphasis on sales backed up by increased LPG production and increased transportation facilities.

The sales of L. P. gas in 1953 are estimated to be 4920 million gal., or nearly 10% more than the 1952 volume. This is an increase of almost 443 million gal. and nearly double the gallonage increase registered during the preceding year. New production, transportation, distribution, and storage facilities emphasize the need for greater sales effort in 1954.

Domestic and motor fuel use is estimated to have increased more than 295 million gal., or 11.2%.

Industrial and miscellaneous is down to nearly 3%.

Gas manufacturing or utility use dropped 5%.

Chemical use registered the largest single category increase by a gain of 16.6% during the year.

LPG used for manufacture of synthetic rubber components (included for the first time in this report) gained 7.5%.

Domestic and motor fuel. Estimated sales of L. P. gas for domestic and internal combustion engine fuel use in 1953 reached 2932 million gal., representing an increase of nearly 300 million gal. over 1952.

As usual, the weather played a dominant part in the sales picture. The above-average temperatures which prevailed throughout most of the year, and especially during the first and last quarters, reduced the demand for heating purposes and thus somewhat lowered the banner sales peak the industry might otherwise have easily achieved.

The industry enjoyed a good summer from a sales standpoint. There are several reasons for this: (1) the tremendous amount required in the southwest for irrigation; (2) increased use as a tractor fuel; and (3) the filling of customer and bulk distributors' storage.

Househeating continues to increase with more people in central and even northern areas discovering the comfort and convenience this fuel brings.

During 1953 an estimated 450,000 ranges were shipped for use with LPG. This is an increase of 2% over the number shipped last year. While the ratio of gas range sales to electric range sales dropped from almost 2 to 1 to nearly 1.5 to 1, the water heater sales presented just the reverse picture. Automatic L. P. gas water heater sales are estimated to be about 285,000 units. The L. P. gas-fired clothes dryer is proving to be very popular. Shipments of floor, space and wall type furnaces numbered over 400,000 units and represent about 20% of the total production of this type of gas-fired appliances. It is particularly interesting to note the active and increasing interest in L. P. gas as fuel for the warm air furnace. It is estimated that 7.5% of the warm air furnaces were for LPG. A noticeable percentage of the conversion burners for warm air furnaces were for LPG.

While it is extremely difficult to pinpoint the amount of L. P. gas used as engine fuel, it is conservatively estimated that this use alone required nearly 500 million gal. in 1953, or almost 10% of the total sales. Spot surveys indicate that the consumption of LPG as internal combustion engine fuel in certain sections of the south and southwest is as high as 50% of the total LPG sales.

A recent survey indicates that about 2000 buses will be operating on LPG by the end of 1953. One more major tractor manufacturer has announced the start of production of two of its tractor models factory-equipped to use L. P. gas as fuel. A major truck manufacturer has extended his line of LPG fueled trucks to some of the smaller models.

One of the most surprising developments during the year was the "sudden" development of interest in the use of LPG as motor fuel for industrial tractors and lift trucks. Several of the major manufacturers are now offering factory-equipped L. P. gas models.

Industrial and miscellaneous use. The amount of L. P. gas used for industrial and miscellaneous application i

estimated to have dropped 2.9% during 1953. The main reason for the reduction in industrial use of LPG is the extensions of natural gas lines or increases made in the capacity of existing lines. The standby sales for industrial uses were not up to normal because the relatively mild weather made it unnecessary to operate the standby plants in many cases.

The railroads are watching with more than average interest an experiment of the Union Pacific with an L. P. gas-fired turbine locomotive. Its clean burning characteristics are of particular note.

Utility use. Sales of LPG for gas manufacturing purposes are estimated to be 247 million gal., a decrease of 5% compared to 1952. Above-average temperatures and changeover to natural gas accounted for the drop.

It is interesting to note, though, that many new large housing developments are being served by L. P. gas through the mains simply because natural gas is not yet available in necessary quantities.

Chemical manufacture. Sales of L. P. gas as a raw material for the manufacture of chemicals and chemical intermediates rose sharply, after a moderate increase the previous year, passing the 1-billion-gal. mark. The estimated sales were 1016 million gal., representing an increase of 16.6% over 1952.

It has been estimated that 25% by weight of all chemicals produced in the United States during 1952 came from petroleum and natural gas sources, including LPG, and that this percentage will increase to 50% by 1965.

Rubber. The use of L. P. gas as a raw material for the manufacture of synthetic rubber components increased an estimated 7.5% so that the total volume for this use approaches 400 million gal. annually.

Supply. As might be expected, a sales increase of nearly 450 million gal. requires new sources of production. The production segment of the industry kept pace with the addition of 15 plants during the year which have an estimated production capacity of 550 million gal. per year. Notable among the new plants coming on-stream was the National Petro-Chemical Corp. plant at Tuscola, Ill.

Next year it is estimated that at least 12 new plants will come on-stream with more than 220-million-gal. capacity. This includes two new Canadian plants and a new plant in the Williston Basin in North Dakota.

Storage. The storage picture is the brightest perhaps that it has ever been. It is estimated that there are 67 completed underground storage installations having a capacity of over 205 million gal. There are 76 more such installations either under consideration or construction which will have a capacity of around 285 million gal.

Transportation. There are now an estimated 23,500 high pressure cars in service. About 7000 of these are in chemical service which means that nearly 16,500 are LPG cars. It is also estimated that nearly 2100 L. P. gas cars were added during the year. The search for lower cost transportation continues. A new sea-going L. P. gas barge to serve Florida and Cuban markets has just been launched. This is the first sea-going barge designed to haul LPG exclusively. Pipeline movements increased during the year. Truck movements of L. P. gas showed a big increase during the year. The underground storage program is one reason for this increase because every time a new storage facility is completed it will increase local truck movements from that point.

MARKETED PRODUCTION OF LPG**

Year	Total Sales Gallons (in thou.)	Total Sales Per Cent Increase	Domestic & Meter Fuel*	Per Cent Increase	Industrial Misc. [4]	Per Cent Increase	Gas Mfg.	Per Cent Increase	Chemical Mfg.	Per Cent Increase	Rubber Components	Per Cent Increase
1922	223	....	Sale of liquefied petroleum gas confined primarily to bottled gas business prior to 1928									
1923	277	24.4										
1924	376	36.0										
1925	404	7.2										
1926	465	15.2										
1927	1,091	134.6										
1928	4,523	314.6	2,600	.....	400	.....	1,500	....				
1929	9,931	119.6	5,900	126.9	1,500	275.0	2,500	66.7				
1930	18,017	81.4	11,800	100.0	2,200	46.7	4,000	60.0				
1931	28,770	59.7	15,295	29.6	7,172	226.0	6,303	57.6				
1932	34,115	18.6	16,244	6.2	8,167	13.9	9,703	53.9				
1933	38,931	14.1	16,626	2.3	13,987	71.3	8,318	-14.3				
1934	56,427	44.9	17,681	6.3	32,448	132.0	6,298	-24.3				
1935	76,855	36.2	21,380	20.9	47,894	47.6	7,581	20.4				
1936	106,452	38.8	30,014	40.4	67,267	40.4	9,371	23.6				
1937	141,400	32.6	40,823	36.0	62,610	([3])	11,175	19.3	26,792	....		
1938	165,201	16.8	57,832	41.7	62,694	0.0	12,386	10.8	32,299	20.5		
1939	223,580	35.3	87,530	51.4	93,723	49.4	15,435	24.6	26,892	-16.7		
1940	313,456	40.2	134,018	53.1	124,482	32.8	20,285	31.4	34,671	29.0		
1941	462,852	47.7	220,722	64.7	172,669	68.6	25,255	24.5	44,206	27.5		
1942	585,440	26.5	303,857	37.6	197,179	14.2	31,366	24.2	53,038	20.0		
1943	675,233	15.3	344,962	13.6	237,396	20.4	37,519	19.6	55,356	4.4		
1944	898,071	33.0	445,617	29.2	254,590	7.3	45,879	22.3	151,985	175.0		
1945	1,067,979	19.0	533,262	19.7	256,577	0.8	53,849	17.4	224,291	47.5		
1946	1,410,370	32.1	758,466	42.2	253,745	- 1.1	86,660	61.0	311,499	38.8		
1947	2,209,797	42.4	1,150,538	51.7	274,125	8.0	169,332	95.4	414,267	33.0	201,535	....
1948	2,736,801	25.0	1,473,289	28.1	275,883	0.6	237,038	40.3	524,350	26.6	225,641	11.9
1949	2,836,599	5.9	1,627,550	10.5	247,103	-10.4	239,210	0.6	544,886	3.9	177,850	-21.1
1950	3,482,567	22.4	2,022,464	24.3	355,456	([3])	251,694	5.2	624,468	14.6	228,485	24.7
1951	4,227,275	18.4	2,456,804	21.6	269,408	([3])	281,692	11.9	844,507	35.2	374,864	64.5
1952	4,477,379	5.9	2,636,736	7.4	338,959	26.0	259,697	- 7.8	870,990	3.1	370,997	- 1.1
1953	4,920,000	9.9	2,932,000	11.2	326,000	- 2.9	247,000	- 5.0	1,016,000	16.6	399,000	7.5

*Household use plus other requirements by these customers such as irrigation pumping, tractor fuel, flame weeding, chicken brooding, and similar uses. Included also is LPG sold by domestic distributors but used for industrial purposes. Included also, in 1951, 1952, and 1953 only, is LPG sold direct by producers and marketers solely for fueling internal combustion engines.

[1]For all years prior to 1951, include LPG sold for refueling internal combustion engines.

[2]Not comparable due to segregation of chemical manufacturing.

[3]Not comparable due to change in method of reporting LPG sold for refueling internal combustion engines.

**L. P. gas used for manufacture of synthetic rubber components is included in this report for the first time this year.

REMARKS: In this table total sales for all years except 1953 were obtained from U. S. Bureau of Mines reports. Distribution for the years 1931 to 1952, inclusive, was obtained from the same source. All other volumes were estimated by the writers. The total sales volume includes all LPG (propane, butane and propane-butane mixtures) when sold as such. Until 1944 the sale of pentane when sold for any purpose other than motor fuel blending was included. Since then it has been excluded. It does not include butane when blended with heavier petroleum fractions for motor gasoline purposes. Intercompany sales transactions such as purchases of LPG by one company from other companies and resold as LPG have been eliminated in order to avoid duplication of sales figures.

Many utilities are just now beginning to use plastic in test installations.

"big news"

Interest quickens in plastic as a prime piping material

By BILL CLARK

"We already have 100,000 ft of plastic services on our lines, and will continue to install new services in 1954."

"We're putting 5000 ft of it on our lines for test purposes."

"We have on order 2000 ft for installation in 1954 on a limited basis."

"We are intensely interested in using it for mains. We need more information; how about it?"

THESE typical comments, made in reply to a survey just completed by *GAS* magazine, sum up better than could any sweeping prophecies the outlook for plastic tubing's use in the gas industry in 1954. As a prime material for gas piping, plastic has not yet "arrived"; however, the rate of its adoption by gas utilities in the past two years has been of the order of several hundred percent.

Even interest in its potentialities is a reliable indicator of its increasing stature, and interest has spread quickly in the 21 months since *GAS* conducted its last survey on the subject. Some companies that, in early 1952, replied to the first *GAS* survey in terms that were equivalent of "plastic tubing? What's that?" are now beginning to show keen interest. A number of them have already placed orders for the material on a test scale.

The large and prompt response to the questionnaires is itself an indicator that cannot be overlooked. In 1952, inquiries to a selected mailing list brought but 64 replies; today, from essentially the same list, 139 replies were received, most of them within the span of a fortnight.

In brief, eight companies are using plastic piping on a moderate-to-large scale; 21 companies are already testing it on a small-to-moderate scale; 17 more companies are just now, or shortly will be, using it on a test basis; 12 other companies have no immediate plans to use it, but expressed interest in it and are awaiting developments; one company has discontinued its use; and 80 companies have indicated no intention of using it now.

On the definite side of the picture, then, 46 companies are now or soon will be installing plastic piping for either regular use or test use. This contrasts with a total of 10 companies that in 1952 were either using it or planning to test it. (In certain of these latter cases, there was no definite time specified for the starting of the tests.)

These companies are testing plastics:

Alabama Gas Corp.
Atlanta Gas Light Co.
Boston Consolidated Gas Co.
Brooklyn Borough Gas Co.
Brooklyn Union Gas Co.
Central Electric & Gas Co.
Chattanooga Gas Co.
Cheyenne Light Fuel & Power Co.
Columbia Gas System Companies
Consolidated Gas Utilities Corp.
Corpus Christi Gas Div.
East Ohio Gas Co.
Milwaukee Gas Light Co.
Long Beach (Calif.) Municipal Gas Dept.
Northern Indiana Public Service Co.
Pacific Gas & Electric Co.
Public Service Electric & Gas Co.
Rochester Gas & Electric Corp.
Southern Counties Gas Co.
Southern Union Gas Co.
Southwest Natural Gas Co.
Union Gas & Electric Co.
Washington Gas Light Co.
Wisconsin Power & Light Co.

Inasmuch as the mailing list used for this survey does not include many of the smaller and medium sized companies in the United States, the number of actual users listed is not complete. The city of Avalon, Santa Catalina Island (Calif.), for example, distributes propane-air through a small system, which was recently completely replaced with plastic mains and services. (See *GAS*, July, page 32.) Tucson (Ariz.) Gas, which is not included in this tabulation, has used considerable plastic in the last year in its system.

It is of interest to note, in this connection, that among the smaller companies application of plastic has extended to the mains themselves. This is a more recent development, naturally following its use in services.

Possibly the most enthusiastic user of plastic piping at the present time is the Public Service Co. of Colorado, Denver. Not one of the earliest pioneers in the use of the material, Public Service has nevertheless quickly expanded its use of the material. Starting in 1951, with 16,000 ft of services, the company used 58,000 ft in the first 10 months of 1953 and plans to put 175,000 ft in its system in 1954. Percentagewise, plastic has accounted for 9.6% of total footage laid in the past year.

One hundred thousand feet, or four-sevenths of the total footage to be used in 1954, will be used for insertion in old services. This is a practice of recent origin with the company, and it is working out well.

"We are particularly enthusiastic

GAS exclusive

about its use potential for service pipe replacement by insertion," reports John F. Fugazzi, distribution maintenance engineer for Public Service. "This technique has been adopted as a standard method of service renewal in our operations."

Another heavy user is the City of Hastings (Neb.) gas department, which installed 12,000 ft of 1-in. polyethylene and 2000 ft of butyrate in 1952, and 69,000 ft of mains in 1953. The figure for services represents 10% of total service footage.

Supt. P. K. Giffin reports no troubles with the material "other than public reluctance to try anything new." He likes plastic's freedom from corrosion and cost advantages.

The largest utility to adopt plastic tubing in recent months is Peoples Gas Light & Coke Co., Chicago, which installed its first plastic services in December 1952, and through last November had placed 130,000 ft in use. This impressive figure represented 32% of the year's service renewal work. Peoples plans to increase the percentage to between 60 and 70% this year, with all of it being inserted in old steel pipes.

These companies are using plastic tubing:

Arizona Public Service Co.
City Utilities of Springfield, Mo.
City of Hastings (Neb.) Gas Dept.
Minneapolis Gas Co.
Peoples Gas Light & Coke Co.
Public Service Co. of Colorado
Southern California Gas Co.

Peoples follows installation techniques developed for use with copper pipe, Assistant General Superintendent E. F. Schuldt reports. Plastic is inserted in old services using Normac brass fittings at the main with the Normac bushing adapter used inside the basement walls where it is held rigid by the old service pipe. Twenty-foot lengths of Tenite II are coupled together with plastic sleeves. Inner steel sleeves are used to reinforce the plastic pipe at the main and house end of the service where compression joints are used to tie the plastic to brass or steel fittings.

"The only failures we have had have been due to installations that were not made according to standards," says Mr. Schuldt.

City Utilities of Springfield, Mo., began using plastic pipe on a limited basis in 1952. Since that time, 600 ft has been installed for renewing leaking services, and this quantity will be stepped up to 1000 ft in 1954. W. M. Gaylord, manager of the gas department, likes it for its resistance to galvanic action, ease of installation, and lower cost of installation. His only objection to date is that tolerances are not maintained "close enough."

Arizona Public Service Co., Phoenix, used 1500 ft for services in 1953, and will use 5000 ft in 1954. Half of this will be inserted in old services, half in new ones. The company also plans to lay 2000 ft of plastic mains.

So far, the company has found plastic satisfactory, although General Superintendent Roy Richards recommends that "plastic tubing sizes be set the same as steel or copper specifications in order that available adaptors, couplings, and fittings may be utilized."

Minneapolis Gas Co., one of the first to use plastic (1948), is installing 10,000 ft in 1954. Southern California Gas Co. is continuing its use of plastic on a large scale. Among those who reported using it two years ago, only Mountain Fuel Supply Co., Salt Lake, has discontinued it.

Test installations are being made all over the map—from Boston, Mass. to Dallas, Texas, to Cheyenne, Wyo., and intervening points. In Birmingham, Alabama Gas Corp. has used about 1500 ft in old services. Atlanta Gas Light Co., on the other hand, has but two experimental services, and Boston is ready to start tests with some samples.

Brooklyn Borough, looking to the day when the economics might favor plastics, has installed 88 ft of service since October 1953, and expects to add 2000 ft in 1954, of which 1500 ft will be for new services. Columbia Gas System has a few scattered "blind" services of plastic installed for tests to determine its corrosion resistant qualities.

These companies plan to test plastic tubing in 1954:

Amarillo Gas Co.
Arkansas Western Gas Co.
Cincinnati Gas & Electric Co.
Consumers Power Co.
Kansas-Colorado Utilities Inc.
Lone Star Gas Co.
Montana Power Co.
Nashville Gas Co.
Niagara Mohawk Power Corp.
Ohio Fuel Gas Co.
Petersburg & Hopewell Gas Co.
Public Service Co. of North Carolina
Roanoke Gas Co.
South Carolina Electric & Gas Co.
United Gas Corp.
West Tennessee Gas Co.
Western States Utilities Co.
Wisconsin Public Service Corp.
Holyoke (Mass.) Gas & Electric

A number of companies plan to start their tests in 1954. Arkansas Western Gas, Fayetteville, might be called typical; it plans to use about 1000 ft of plastic in 1954. Cincinnati Gas will install a "limited number of plastic services in 1954 to obtain practical experience," according to Vice President Milton J. Pfeiffer.

At Kansas-Colorado Utilities Inc., President Reece E. McGee reports he hopes "plastic pipe will solve some of our problems. There is considerable 'hot ground' in our area."

Lone Star, Dallas, will try 1000 ft of it for trial purposes, while Nashville (Tenn.) Gas Co. plans on using about 2000 ft for experiments. Niagara Mohawk Power, Syracuse, N. Y., has a technical committee studying plastic pipe, and will make some experimental installation in 1954.

Among the largest scale test programs in 1954 will be that undertaken by United Gas Corp., which will lay 10,000 ft during the early part of the

Plastics, Pipe, and Progress

In 1940 the total poundage of plastics sold for molding, extruding, and laminating was approximately 300 million. This figure is exclusive of plastics used for fibers, paints, and coatings. Today it is estimated that this figure has increased 10-fold to a total of 3 billion lb. Polyethylene moved from virtually nothing in 1944 to approximately 130 million in 1952. By 1955 it is expected that this material will be manufactured at the rate of three-quarters of a billion pounds. Vinyl production has moved from 200 million in 1946 to 500 million this year.

Plastic pipe production is growing in proportion to the plastics industry itself. From perhaps 200,000 lb in 1949, the figure for 1953 could be safely estimated at 12 million lb and estimates for 1960 are for an annual production rate of 250 million lb.

We have no illusions and no fears—no illusions that plastic pipe will cure all troubles—no fear that steel pipe will be elbowed aside by this comparative upstart in the tubular field. Each type has certain advantages—each has certain limitations—each has its own fields of application—each is a basic material in its own right—neither is a substitute for the other.

Recognition of plastics in the pipe field has now come from two leading steel pipe producers—more will likely follow.

—J. W. Owings
Republic Steel Corp.

year. Says A. D. Simpson Jr., chief engineer:

"We hope to be able to gather detailed information as to construction practices, installation details, and operating data which we could reasonably expect to experience as a result of using the material on the Gulf Coast.

"We are extremely interested in the development of this product and it is our opinion that it has a place in gas distribution construction materials."

The City of Holyoke, Mass., is also getting into a testing program of considerable magnitude, percentagewise. The 1000 ft of plastic the company plans to lay in 1954 will represent 10% of total service footage to be installed.

A dozen companies expressed real interest in plastic. Typical reaction among this group was the remark of Vice President C. E. Mattingly, Minnesota Natural Gas Co., who said he "would like to know more about experiences of utilities presently using it."

On the other hand, Stevan B. Smith of Northwestern Light & Power Co., Cedar Rapids, Iowa, is waiting until plastic has shown what it can do in mains. "It seems to me," wrote Mr. Smith, "that services are not necessarily the real problem in gas distribution. . . . We have followed quite closely California and Colorado uses of plastics for services; we are much interested to learn more about the uses of plastic for mains."

More than half of the companies responding are still not using plastic and show no inclination to do so—at least at present. Why? Well, here are some enlightening remarks:

"Under winter conditions we experience up to 4 ft of ground frost. We believe more experience with plastic pipe should be available before we adopt the material for mains and services under this condition."—Central Hudson Gas & Electric, Poughkeepsie.

"We have not used it because of (1) difficulty of locating buried lines by pipe locator, (2) susceptibility of damage by rodents, gardeners, etc., (3) unknown life—effect of aging, moisture, and environment, (4) low mechanical strength."—Coast Counties Gas & Electric Co., San Francisco.

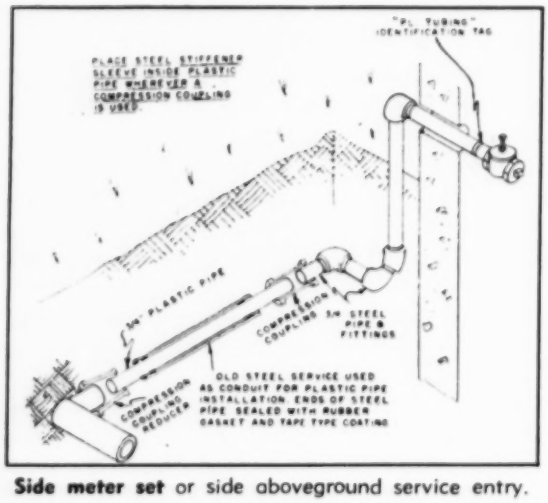
"Not suitable with manufactured gas."—City of Duluth, Minn. (This difficulty was responsible for upwards of one-quarter of the "no" votes.*)

But probably the most enlightening remark of all was this frank admission made by a Kansas utility:

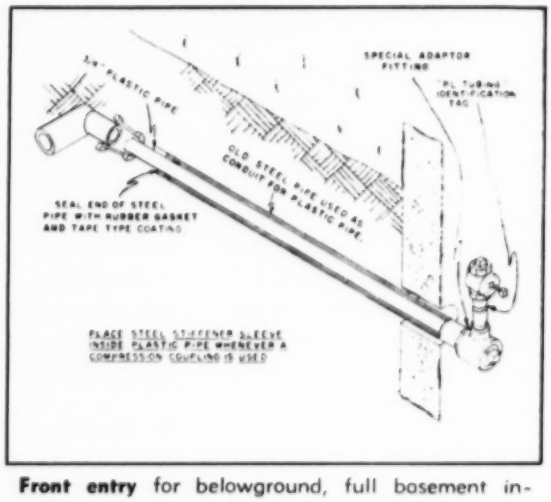
"We'll let larger companies experiment with this."

*Portland (Ore.) Gas & Coke provides more complete data on this problem. Says P. B. O'Rourke: "Despite high pressure absorption that removes 99+% of the aromatic light oils, our manufactured oil-gas still contains enough aromatic light oil at the end of our distribution system, after re-compression, to cause plastic tubing to swell and soften on the few services we have installed experimentally. At the present time we do not anticipate using plastic tubing while on manufactured gas. When natural gas is brought in we certainly will use plastic services for replacements. Use of plastic services in the period of conversion is still questionable and unresolved as yet."

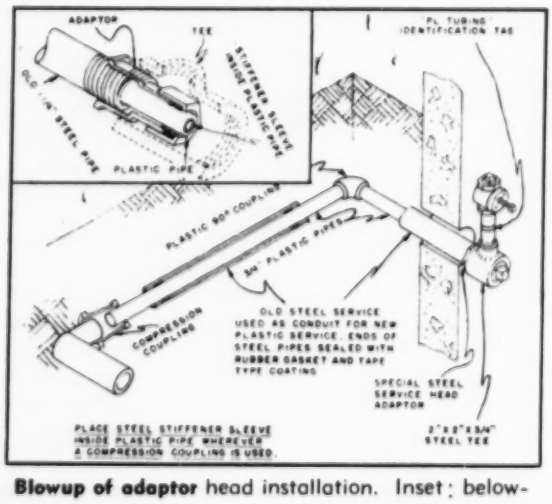
Denver's new plastic insertion method for renewing services


"PL" TUBING IDENTIFICATION TAG
PLACE STEEL STIFFENER SLEEVE INSIDE PLASTIC PIPE WHEREVER A COMPRESSION COUPLING IS USED.
3/4" PLASTIC PIPE
COMPRESSION COUPLING 3/4" STEEL PIPE & FITTINGS
COMPRESSION COUPLING REDUCER
OLD STEEL SERVICE USED AS CONDUIT FOR PLASTIC PIPE INSTALLATION. ENDS OF STEEL PIPE SEALED WITH RUBBER GASKET AND TAPE TYPE COATING

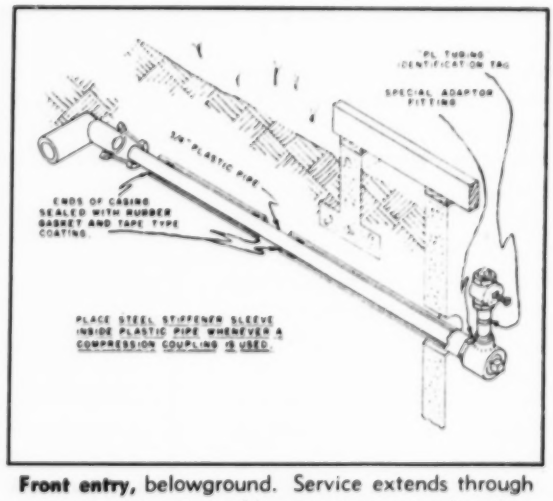
Side meter set or side aboveground service entry.


SPECIAL ADAPTOR FITTING
3/4" PLASTIC PIPE
PL TUBING IDENTIFICATION TAG
OLD STEEL PIPE USED AS CONDUIT FOR PLASTIC PIPE.
SEAL END OF STEEL PIPE WITH RUBBER GASKET AND TAPE TYPE COATING
PLACE STEEL STIFFENER SLEEVE INSIDE PLASTIC PIPE WHENEVER A COMPRESSION COUPLING IS USED

Front entry for belowground, full basement installation.


ADAPTOR
TEE
STIFFENER SLEEVE INSIDE PLASTIC PIPE
PLASTIC PIPE
PL TUBING IDENTIFICATION TAG
PLASTIC BOT COUPLING
3/4" PLASTIC PIPE
COMPRESSION COUPLING
OLD STEEL SERVICE USED AS CONDUIT FOR NEW PLASTIC SERVICE. ENDS OF STEEL PIPES SEALED WITH RUBBER GASKET AND TAPE TYPE COATING
SPECIAL STEEL SERVICE HEAD ADAPTOR
PLACE STEEL STIFFENER SLEEVE INSIDE PLASTIC PIPE WHEREVER A COMPRESSION COUPLING IS USED.
2"X2"X3/4" STEEL TEE

Blowup of adaptor head installation. Inset: belowground service entry.


PL TUBING IDENTIFICATION TAG
SPECIAL ADAPTOR FITTING
3/4" PLASTIC PIPE
ENDS OF CASING SEALED WITH RUBBER GASKET AND TAPE TYPE COATING.
PLACE STEEL STIFFENER SLEEVE INSIDE PLASTIC PIPE WHENEVER A COMPRESSION COUPLING IS USED.

Front entry, belowground. Service extends through unexcavated portion of basement to meter location.

"big news"

FPC tackles mountain of backlogged rate cases; despite faster handling, no real relief seen in '54

By LARSTON D. FARRAR

THE Federal Power Commission is entering 1954 with a backlog of rate cases on which no decision has been made, and the outlook is that not too much can be done to render more expeditious service to the industry in '54 than in '53.

Of course, there *was* improvement over the situation at the end of '53, as compared with the situation at the end of '52, for it was obvious that the new commission—better known as the Eisenhower commission—was working down the backlog in earnest. The backlog was not large as to the actual number of companies involved, but plenty big at that when the amounts are considered.

As of mid-December 1953, the FPC during the year had received requests for increases from 33 natural gas companies whose officials had requested rate hikes totaling $77,564,200. The requests actually granted by the commission during the 11½-month period totaled some $22 million, while some $53.5 million of the increases were "suspended," meaning that they automatically take effect under bond five months after the application is made, and that the FPC then must make an investigation and hold hearings on the requests.

FPC Chairman Jerome Kuykendall recently reiterated to this reporter what he told the American Gas Assn. at its annual meeting. He said that "we are fully aware of the undesirability of rates being collected under bond and being subject to refund. We know this situation creates uncertainty and instability, and are trying to cure it. A number of rate cases have been settled recently, and we think more of them can and should be disposed of in this manner and are encouraging all parties to explore this method of disposing of them."

That, in essence, is the only answer Mr. Kuykendall can give to the rate backlog right now: settlement. Yet, as he recognizes, there comes a time in the history of every company when, to do justice to the public that the FPC serves, only a thorough investigation by the FPC and open hearings can guarantee the commission and the public that the increases granted are fair.

It has been learned on reliable authority that the FPC requested additional funds to hire more investigators, and while Congress granted these funds last year, no new investigators have been employed for the simple reason that the Bureau of the Budget turned down the agency's request for the same funds for the new fiscal year. Because of the prospects of having its funds cut back, the agency has not employed investigators whom it would have to discharge, a circumstance that would be unfair to the employees and unfair to the commission.

However, settlement will be the big word around FPC during 1954, as the commisison strives to cut down the backlog and to settle contemplated increase requests as expeditiously as possible. In the long run, this is only a stopgap procedure, it is recognized, and there *must* be a larger staff for more thorough investigations.

Also, as officials point out, the FPC does not have final say on negotiating many cases that would appear to be amenable to quick procedures. Communities, other gas companies, and sometimes other federal agencies intervene, making an investigation and hearings necessary.

The increases requested in 1953 included a request for an increase of $1400 (the smallest) by Equitable Gas Co. and an application for a $6,579,000 increase from the Mississippi River Fuel Corp. Oddly enough, both increases were granted promptly — the smallest and the largest of the year.

However, the majority of the increases requested have not yet been acted upon. Some 20 are in process of hearing, 12 have been set for hearing, and there are about 10 on which hearings have not been set. The 20 in process of hearing, or decision, include the cases carried over from '51 and '52, of course.

There are approximately 40 rate cases increases still pending before the FPC as the nation heads into 1954.

A year ago, according to a report issued then by FPC, the commission had acted upon a total of $148.9 million in natural gas rate increase applications filed by 30 companies during 1952. This represented a 65% increase over the $97.9 million filed in 1951. Yet, these figures are most deceptive. Out of the total acted on in '52, the FPC suspended $148.1 million and accepted only the remaining $852,000. Of the filings suspended in that year, increases totaling $26.4 million were allowed to become effective, $7.7 million were disalowed and the companies were permitted to withdraw $4.7 million. Out of the remaining $109.1 million, a total of $8.5 million became effective under bond during the year pending final disposition, and $100,602,000 were still under suspension as of Dec. 1, 1952.

Thus, it is apparent, the "new" FPC during 1953 actually worked down a large part of the backlog it had inherited and is making substantial progress toward the remaining cases. Yet, except in petitions that can be settled expeditiously and without challenge, it seems apparent that the commission will have plenty of work stacked up all during '54.

As a matter of fact, a bird's eye view of the enormous amount of study that must go into every case was given this reporter by Chairman Kuykendall recently. He pointed to a stack of documents at least 18 inches high and weighing at least six or seven pounds and said: "This is a part of the depositions made in a petition to *withdraw* a rate case." So, while gas company executives naturally are impatient with delays—and, behind them, the stockholders—it would be possible for them to be sympathetic to the FPC if they understood the situation clearly.

GAS staff report

"big news"

IGT progressing in search for substitute natural gases

By E. S. PETTYJOHN • Institute of Gas Technology, Chicago

THE major portion of the research conducted at the Institute of Gas Technology during the past six years has been directed toward production of substitute natural gases from natural gas condensates, oil, and coal.

Problems of substitutability

The problems of substitutability have been misunderstood. It has been suggested that a 1300-1400 Btu oil gas diluted with products of combustion to an 0.8-0.9 specific gravity 1000 Btu gas would be 100% substitutable for natural gas.

It is true that by control of burner input, through adjustment of the heating value and specific gravity, a high degree of substitutability can often be attained; this does not necessarily result in an interchangeable gas, since the third and most important factor, combustion characteristics, has been neglected. We have redefined an interchangeable gas as one which has the same heating value, the same specific gravity, and the same combustion characteristics, as the natural gas it replaces.

High-heating-value, high-gravity gases

We find that high-heating-value, high-gravity gases may approach 100% substitutability over a narrow range of burner adjustments under the rather nonrigorous tests which we employ, using the —2, 0 and +2 AGA scale burner adjustments, as they will often meet the requirements for lifting, flashback, and excessive yellow-tipping. However, we also find, especially in industrial work, that these gases do not have the same flame characteristics, flame temperatures, and burning velocities, and do not give the same flame heights or flame lengths, as the natural gases they replace. The industrial customer is often in difficulty when some of these substitute gases are introduced.

A year has passed since GAS (January 1953, pages 34-5) last carried a report by Capt. Pettyjohn on progress in the development of substitute natural gases. This work will continue to be "big news" in 1954 as the Institute of Gas Technology pursues the work begun six years ago.

Furthermore, the use of these substitutes has been accompanied in many instances by substantial increases in the number of service failures of domestic appliances. So we have gone beyond our original concept of what we thought would be an interchangeable gas, one which will more nearly conform in combustion characteristics, heating value, and specific gravity. This has led to a necessity to modify our approach.

Gasification of light oils and gasoline

We showed two years ago that if you cracked a light distillate down to about 975 Btu heating value and 0.55 specific gravity, you had a gas that was 100% substitutable. This severity of cracking imposed operating difficulties which many producers found unsuitable to their particular operations. So they made higher-heating-value gases with dilution, with only partially successful substitution.

One answer to this problem may be hydrogasification; that is, pressure gasification in an atmosphere of hydrogen. This work is being sponsored by the East Ohio Gas Co. as a method of meeting peak loads in isolated areas in their distribution system.

In the East Ohio test, using an externally heated tubular furnace, we have carried out the thermal cracking of light hydrocarbons in the absence of hydrogen and at varying pressures, and have found that when we obtained interchangeable gases in the 1050-1070 Btu range with specific gravities around 0.6, we had difficulties with carbon deposition in the tube.

This led to our preliminary tests on pressure hydrogasification. During the past year we have carried these tests substantially further, and have found that addition of 60 cu ft of hydrogen per gal of 26-lb natural gasoline results in complete gasification. There is no solid-liquid residue and the gas is 100% interchangeable with natural.

We hope to extend the tests to 12-lb,

and to straight-run gasolines which are readily available and have lower vapor pressures, and consequently lower storage costs.

Cyclic oil gas generator

We have a proposal before the gas production research committee to build a cyclic oil gas generator which we can operate under pressure, and in which we can superheat our hydrogen for hydro-gasification under pressure, to see what improvement we can obtain under cyclic operation as compared with the tube furnace.

Our reason for going to cyclic operation is the problem of carbon deposition. With 26-lb gasoline, without the hydrogen, we had carbon deposition in the tube. The heavy gas oils or light residual oils have excess carbon which is deposited on the checkerwork, and is burned in the succeeding blast, in accordance with the principles of the Hall process. This carbon cannot be economically hydrogenated.

But we hope to improve gas yields and to make a completely substitutable gas by hydrogenating the unsaturates during the gas-making process. We have found in our work that going through the incipient cracking stage in an atmosphere of hydrogen, that is, preheating the charging stock and coming up to the cracking conditions in an atmosphere of hydrogen, provides for a more complete absorption of the hydrogen in the oil, as opposed to an injection of hydrogen into the cracking atmosphere at the cracking conditions. In other words, the soaking period provides for substantial hydrogenation.

Catalytic autohydrogenation

The alternative to saturating the unsaturates during cracking is to saturate them after the gas is made; we call that process *autohydrogenation*. That is, we use the hydrogen in the gas to hydrogenate the unsaturates, employing a catalyst to promote the reaction.

We have carried this process forward in fixed beds in the laboratory and in our pilot plant, using high-Btu oil gases and the gases from the East Ohio unit, and have found that catalyst regeneration due to carbon deposition results in excessive loss of time.

To do the job properly we should have a moving bed which can be regenerated continuously, similar to the two-shell fluid process, where part of the bed is being regenerated in one cham-

High-Btu gas from coal seen as best available substitute for natural gas

Last month, the AGA released its condensed report on a search for high-Btu gas from coal. As the study indicates, such a gas "appears to be the most logical substitute for natural gas." Said AGA:

LOOKING into the distant future when supplies of natural gas may diminish, the gas industry has been seeking an available supplement for natural gas if the need arises.

The gas production research committee of the American Gas Assn. has completed a critical survey of the most advanced methods of making high-Btu gas from coal. These studies were carried on as a part of the PAR Plan.

The report is a highly condensed summary of an exhaustive literature search by experts of long experience in coal processing and utilization. The report points out that the high capital investment required for the manufacture of gas from coal will dictate that gasification should be essentially a base-load operation.

High-Btu gas produced from coal appears to be the most logical substitute for natural gas for two reasons. A substitute gas must have a high heating value to replace natural gas. Coal is the only reasonable choice as a raw material for gas manufacture, because of the extensive coal reserves in the United States.

For years to come high-Btu gas made from coal will cost more than natural gas, even when the higher cost of transporting natural gas over longer distances is considered. Studies indicate, however, that before natural gas is universally short in supply, the manufacture of high-Btu gas will be justified economically in some areas to satisfy a growing market. Production of high-Btu gas in these areas will provide for increased sales, and for better utilization of existing pipelines and storage facilities.

Expert opinion differs widely as to the exact time and areas where ultimate shortages in pipeline supplies will occur. Nor is there unanimity of opinion as to the exact points at which the falling costs of high-Btu gas, as a result of technical advances in manufacturing methods, will cross the rising costs of natural gas due to diminishing reserves and increasing transportation costs.

Substantial research expenditures have been made over a number of years in the PAR research program covering selected phases of this problem. It was felt that authoritative and comprehensive studies should be made of existing methods and processes, both as to economics and techniques to determine future research expenditures in this complex field. Battelle Memorial Institute, Columbus, Ohio, was selected to do this work. The survey report marks the completion of these studies.

The authors of the survey do not agree that because natural gas reserves are at an all-time high and discoveries are continuing, the problems of finding a substitute for natural gas is not a pressing matter. In their opinion the large reserves do not justify complacency for these reasons.

The technical development of an ideal gasification process may take 10 years from concept, through laboratory research, to pilot plants and then to the design and construction of commercial installations. Plans also must be made to combine all parts of an integrated gasification industry from coal mining to gas distribution. Finally, coal cost will be such a large part of the total gas cost, that only newly opened, modernly equipped mines with reserves adequate to outlast the gas-making equipment can meet the requirements.

Chapter 1 describes the broad objectives and basic assumptions of the survey; Chapter 2 offers an excellent resumé of the principles of high-Btu gas manufacture; Chapter 3 details the more important gasification processes; and Chapter 4 discusses the solid fuel characteristics which are significant for gasification. Chapter 5 is a critical examination of the relation of temperature and pressure variables in the gasification processes. Chapter 6 deals directly with the research problems of the future and discusses the most promising process modifications.

The report, which is priced at $4, makes a major and most timely contribution to the subject of making pipeline gas from coal.

Miles of extruded Tenite cellulose acetate butyrate plastic tubing now deliver gas from mains to homes. Flexible Tenite lines are a quick answer to many service replacement problems. They can be inserted in existing steel casing, thus eliminating ditching and other time-consuming labor.

The ½-in. tubing comes in lightweight 200-ft. coils which are easily handled by one man. A few strokes with a saw cut it to desired lengths. In gas line installations it gives long service unaffected by corrosion or electrolytic action.

gas service lines

Tenite is also in wide use for corrosion-resistant pipelines conducting oil, salt water, and other liquids. The tough plastic, either opaque or transparent, is extruded in a variety of pipe sizes.

For more information about the use of Tenite for pipe, fittings, and numerous other extruded or molded applications, write—
EASTMAN CHEMICAL PRODUCTS, INC.,
Subsidiary of
EASTMAN KODAK CO., Kingsport, Tennessee

TENITE

an Eastman plastic

● Information regarding Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Houston, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, Seattle, and Washington, (D. C.); and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

ber while the remainder of the bed is being subjected to the autohydrogenation reaction.

The disadvantage of the autohydrogenation process is that ethane and propane are formed instead of methane, resulting in a smaller quantity of gas at a higher heating value. Some method of dilution is then necessary to avoid excessive burner inputs.

We have proposed an alternative: removal of the unsaturates by absorption, recycling with the charging stock, and recracking in an atmosphere of hydrogen to form saturated hydrocarbons of lower molecular weight. This work has been proposed for 1954.

Selection of oils

The selection of oils continues to be of major importance. We have seen the gradual degradation of "Bunker C" residual oils, due to the extension of the thermal cracking process in oil refineries. One oil company is now processing residual oils to 35% Conradson carbon residue. (That will be appreciated by companies like Seattle Gas, which now pays a premium of about 50 cents per barrel to get only a 10% Conradson carbon residue.)

Without doubt this trend to squeeze as much as possible out of the residual oil before letting it go on the market as Bunker C fuel oil will continue.

To gasify these heavy oils,, and to add the hydrogen to make a gas with the ratio of CH_4: 4 of hydrogen to 1 of carbon is a distinctly difficult problem. Higher tar recoveries, and more carbon deposition in the sets, mean higher oil charges per Mcf of gas, and reduced capacities.

Crude oil

So it appears that we should at this time explore the use of crude oil as a charging stock.

In the middle '30's, in Marysville, Mich., we used a Midland-Mt. Pleasant 43° API crude in carbureting water-gas, and found we could substitute it gallon for gallon for gas oil. At $1.30 per barrel for the crude as opposed to $3.57 per barrel for gas oil, we saved more than 10 cents per Mcf.

Canadian oils are now becoming available; there is some spot production in fields like the Conroe in Louisiana, and there is also more offshore crude available. We should test these crudes as a substitute for residual fuel oil, although we may have to top some of them to raise their fire and flash points, to reduce storage requirements, as they come into the gas plant.

We are also proposing a study on the storage of hydrocarbons for peak load use, including not only the oils but the light hydrocarbons: propane, butane, natural gasolines, refinery gasolines, and natural gas itself. We have an example near Joliet, Ill., where a cavern is in operation as a storage plant at the present time. We want to explore all of these possibilities, making an economic study if possible.

That is the present situation in our oil and LPG work. We have actually accomplished pressure-hydrogasification and completely converted 26-lb gasoline to an interchangeable natural gas substitute.

Pressure gasification of coal

The third raw material which we propose for the production of a natural gas substitute is coal. Our pressure gasifier has been in operation now for almost two years, and we have started our work on methanation.

We have added two additional coal feeders, increasing the input from the former 500 to the present 1500 lb of coal per hour, in a reactor of 18 in. internal diameter and 7 ft internal height.

We have raised the pressure on the unit from one to five atmospheres, and with this increase have obtained an increase in conversion. That is, we have raised our actual conversion of coal to from 90-92 to 96-98%.

An Illinois coking coal was used in the development of this process. To show the versatility of the unit, we ran a very high-ash-fusion-temperature No. 5 Block seam coal. We are now running a characteristic Pittsburgh seam coking coal and will run a non-coking coal from western Kentucky.

We believe we have progressed far enough with our coal gasification unit to say that it is highly flexible. We are not concerned about particle size, because we employ our flash pulverizer-cyclonizer system to reduce the coal to about 80% passing a 200-mesh screen. Therefore, if we start with coal screenings or refuse there is no handling problem except for the moisture content.

We believe that we have here the one successful process for converting coal into gas economically, using oxygen and steam: one that is operable on a continuous basis, producing a synthesis gas that is readily convertible to a natural gas substitute.

Methanation of the synthesis gas

In our first methanation tests, with iron catalysts in fixed beds, we found it very difficult to satisfactorily control the temperature.

We modified two of the fixed-bed units by adding Dowtherm-cooled jackets for improved temperature control, with partial success, and we are now converting our catalyst units to fluid beds for further improvement in temperature control.

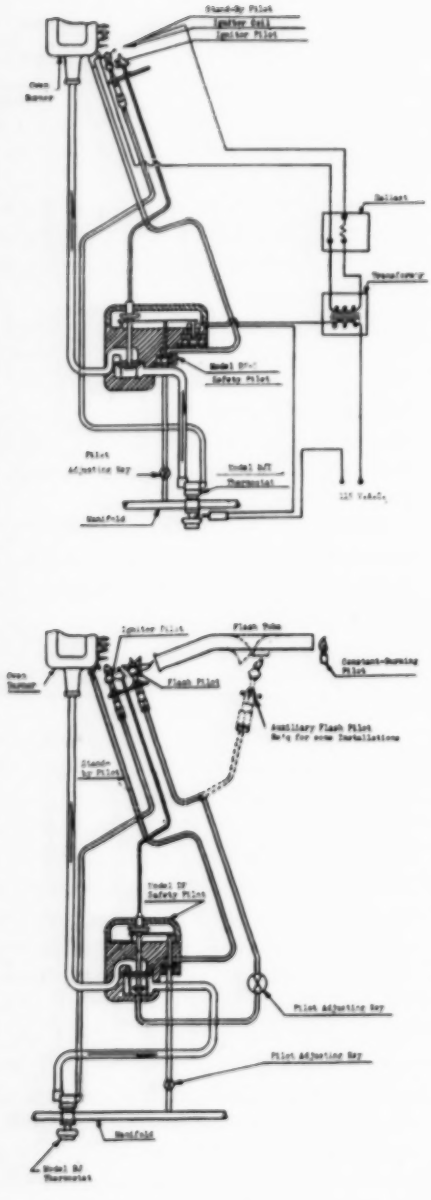
Our initial results indicate that 150 psi is a suitable lower pressure for conversion using iron catalysts. Nickel catalysts have been operated satisfactorily at pressures as low as 15 psi. Thus, we have two lower pressure limits on the two basic catalysts used so far.

We believe that we should operate the coal gasifier at about 150 psi. It may be desirable to operate at greater pressure to accommodate the distribution system. Synthesis gas has been produced at 600 psi and could probably be produced at 1000 psi. However, the added cost of construction of both the reactor system and the auxiliaries must be balanced against the cost of compression of the substitute natural gas.

The conversion of coal to 1000 Btu substitute natural gas is economically feasible. It appears that the reactor investment costs will be the smallest item in expense. The cost for catalysts will be nominal. The major items will be the investment cost of the oxygen plant and the cost of coal. By using screenings and refuse coal, the latter cost will be held to a minimum.

"big news"

"Cold" gas range now ready for formal presentation to public



Robertshaw - Fulton Control Co.'s new flash-tube system (below) and electric system (above).

BASED on a 34-month field test program, the gas industry now is in a position actively to promote gas ranges equipped with electric and gas single-point ignition devices, AGA has announced. This operation is a PAR activity.

Unlike old-style ignition devices, these new automatic ignition devices require no constant burning pilot light when the range is not in use. Great promotional value is inherent in the fact that such automatic mechanisms will substantially decrease both kitchen heat and gas bills, while increasing kitchen comfort and fuel economy.

Eight of the leading manufacturers of gas appliances already have built automatic ignition devices into their gas range models, and many others either are actively engaged or contemplate following suit.

As part of the gas industry's continuing research program, this field study was inaugurated by AGA in 1949. Participating were 48 gas utilities representing practically every important locality in the nation, from New York to California and Michigan to Texas. Nine different types of natural, manufactured, and mixed city gases which were used had heating values from 530 Btu to 1100 Btu to assure satisfactory operation of these automatic devices regardless of gas types available throughout the country.

Also cooperating were manufacturers of six electric and four automatic gas ignition systems who were joined by 16 domestic gas range manufacturers who provided 33 different models for field tests. Each of the 1459 test gas ranges, installed in private homes, averaged 18 months of service under actual operating conditions.

Following release of the project report to the gas industry, it remains for gas appliance manufacturers and gas utilities to utilize these findings to "capitalize completely upon the basic superiority of gas as a fuel for cooking."

Utilities and appliance manufacturers were as pleased with results as were consumers, according to the report. It concluded that "There appears to be every valid reason now why automatic ignition gas range sales should be aggressively pursued and promoted."

Construction and performance of all automatic ignition devices and gas ranges in the 3-year test program originally tested and approved by the AGA Laboratories in Cleveland and Los Angeles, before being delivered for field tests.

Four chief conclusions drawn from field experience with automatic oven and broiler ignition systems are:

1. Both electric and single-point ignition systems operated well on the nine basic gases selected as representative of gas utility company distribution in the United States. No changes other than orifices are required for use with different gases. This fact reduces production costs and simplifies warehousing and distributing problems.

2. Automatic oven and broiler systems of both electric and single-point types proved satisfactory and are fully recommended.

3. Present ASA Approval and Listing Requirements cover the types of ignition systems employed in the field test, although they now should be reviewed again with the results of this study available to the interested subcommittees.

4. Now the gas industry actively can sell and promote with full confidence AGA-approved models of ranges equipped with the new single-point and electric ignition devices.

PARTICIPANTS

Utility Companies

Alabama Gas Corp., Birmingham
Arkansas Western Gas Co., Fayettville
Atlanta Gas Light Co.
Boston Consolidated Gas Co.
Bridgeport (Conn.) Gas Light Co.
The Brooklyn Union Gas Co.
Cambridge (Mass.) Gas Light Co.
Central Illinois Electric & Gas Co., Rockford
Central Indiana Gas Co., Muncie
Citizens Gas & Coke Utility, Indianapolis
Consolidated Gas Electric Light & Power Co., Baltimore
The East Ohio Gas Co., Cleveland
Equitable Gas Co., Pittsburgh
Hartford (Conn.) Gas Co.
Houston Natural Gas Co.
Indiana Gas & Water Co., Inc., Indianapolis
Iowa-Illinois Gas & Electric Co., Davenport, Iowa
Laclede Gas Co., St. Louis
Lone Star Gas Co., Dallas
Long Island Lighting Co., Mineola, N. Y.
Manufacturers Light & Heat Co., Pittsburgh
Metropolitan Utilities District, Omaha, Nebr.
Michigan Consolidated Gas Co., Detroit
Milwaukee Gas Light Co.
Minneapolis Gas Co.
Montana-Dakota Utilities Co., Minneapolis
Mountain Fuel Supply Co., Salt Lake City
Nashville (Tenn.) Gas Co.
New Bedford (Mass.) Gas & Edison Light Co.
North Shore Gas Co., Waukegan, Ill.
Northern Indiana Public Service Co., Hammond
Ohio Fuel Gas Co., Columbus
Oklahoma Natural Gas Co., Tulsa
Pacific Gas & Electric Co., San Francisco
The Philadelphia Gas Works Div. of UGI
The Peoples Gas Light & Coke Co., Chicago
Portland (Ore.) Gas & Coke Co.
Providence (R. I.) Gas Co.
Public Service Electric & Gas Co., Newark
Public Service Company of Colorado, Denver
Rochester (N. Y.) Gas & Electric Corp.
Seattle Gas Co.
Southern California Gas Co., Los Angeles
Southern Counties Gas Co., Los Angeles
Springfield (Mass.) Gas Light Co.
United Gas Corp., Houston
Washington Gas Light Co., Washington, D. C.
Worcester (Mass.) Gas Light Co.

Range Manufacturers

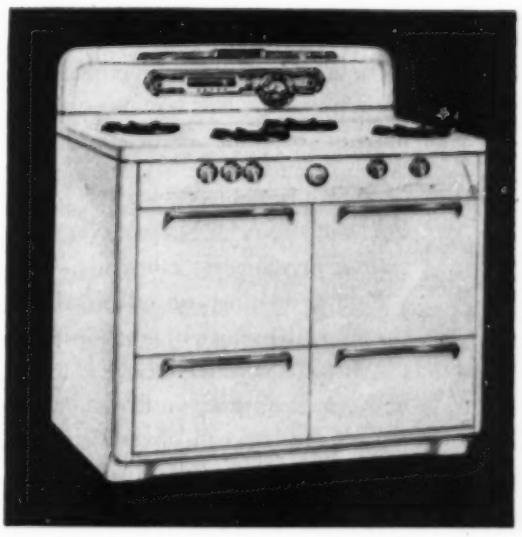
Caloric Stove Corp.
Cribben & Sexton Co.
Detroit-Michigan Stove Co.
Globe American Corp.
Hardwick Stove Co.
Magic Chef, Inc.
Malleable Iron Range Co.
The Maytag Co.
Odin Manufacturing Co.
O'Keefe & Merritt Co.
RCA Estate Appliance Corp.
Rheem Manufacturing Co., Wedgewood Div.
George D. Roper Corp.
Sunray Stove Co., Grand Industries Div.
The Tappan Stove Co.
Utility Appliance Corp., Gaffers & Sattler Div.
Western Stove Co.

Control Manufacturers

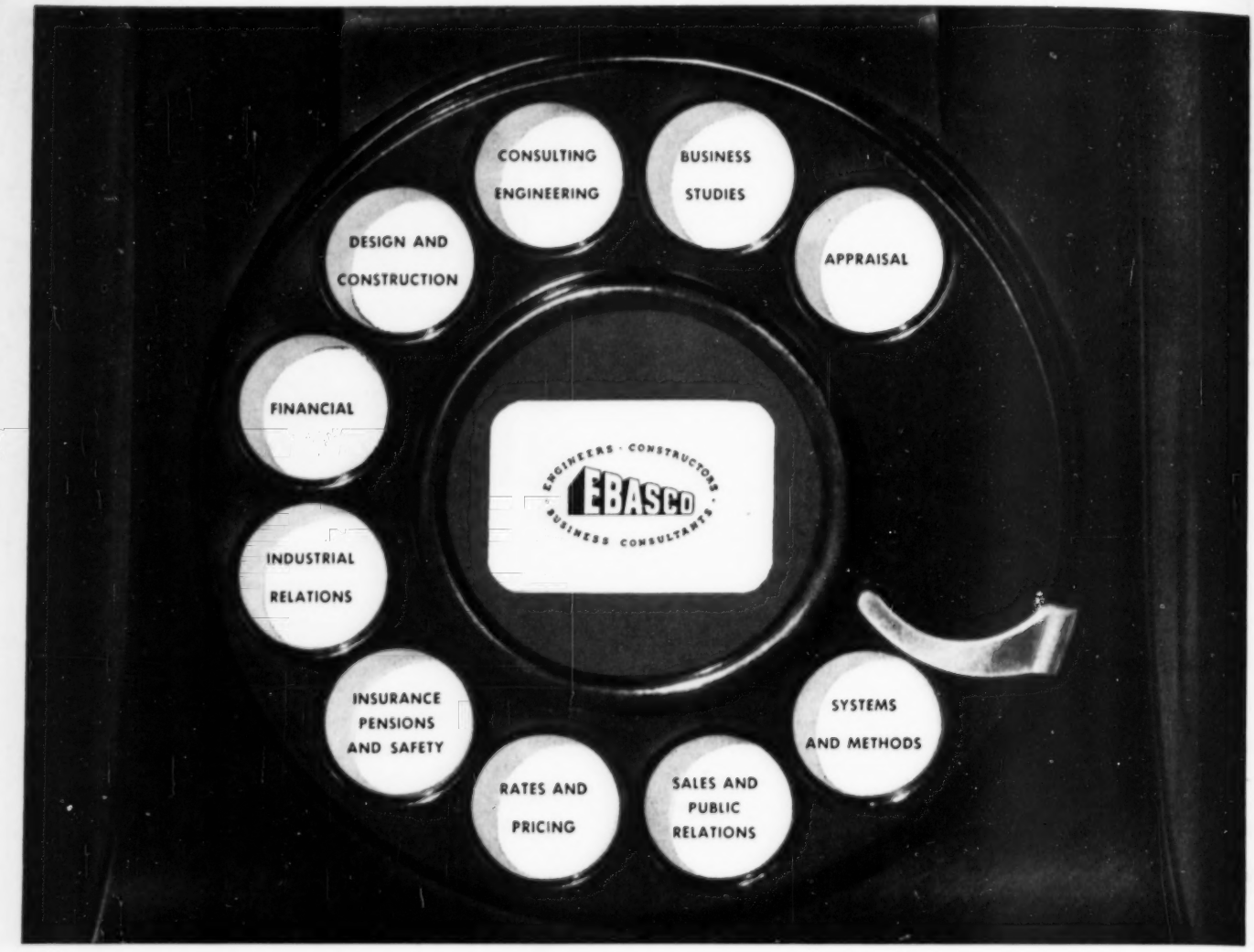
Bryant Heater Div. of AGE
Patrol Valve Co.
Penn Electric Switch Co.
Perfex Corp.
Robertshaw-Fulton Controls Co.

Tappan is one of a number of ranges with new automatic ignition devices.

Detroit-Michigan has several models with automatic ignition.



Roper Corp. is devoting a good share of its production to new automatic ranges.



When you call for these services in 1954....

In the year ahead, chances are your firm will need services like these. Since few companies maintain staffs large enough to include specialists in all these fields, more and more management men are finding that the best way to get the assistance they need is to call an organization like Ebasco.

For when you call Ebasco, you call a team of specialists—engineers, constructors, business consultants—men whose technical talents are at a premium in today's tight manpower market. They provide you with the service your particular problem requires—and do it without adding to your permanent payroll, overburdening your busy staff or wasting the valuable time of your top executives.

Next time a need arises in your company for special assistance in any phase of business operations, ask your operator to connect you with Ebasco.

For more details on how you can put this reservoir of experience to work for you, write for your free copy of "The Inside Story of Outside Help." Address: Ebasco Services Incorporated, Dept. F, Two Rector Street, New York 6, N. Y.

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A big job for gas industry in 1954 is making GID work

By **LYLE C. HARVEY** • Affiliated Gas Equipment Inc., Cleveland

WHEN a utility says that the GID Program is sound, is good, but that it does not apply to them because they are already doing everything . . . I say that's shadowboxing!

When a utility says that a gas appliance must be priced lower than competitive products to be salable . . . that's shadowboxing, too!

When a utility says that because the sales of gas are up, there is no need to worry about appliances, sales promotion, aggressive selling activity . . . that's shadowboxing!

When a utility says that they may take part in the replacement market but they can't determine the kind of appliances that go into NEW construction . . . shadowboxing again!

When a gas transmission company adopts the attitude that they are not concerned with what happens after the gas leaves their lines . . . I say that's shadowboxing!

AND when a manufacturer says, "I'll build my product with the main idea of pricing it on the underside of competition so as to get it on the mass market" . . . that's more shadowboxing!

When a manufacturer says he does not need to do engineering and development, advertising and promotion, because someone else will do it . . . I say that's shadowboxing!

How can we be so complacent with being on "dead center"?

How can we be so disinterested when progress in our residential gas program is so slow and when, in so many instances, competition is making dangerously impressive inroads into our market?

As we look ahead to the new year, it is fitting that we look squarely at the challenge so forcefully stated by Lyle Harvey, president of the Affiliated Gas Equipment Inc. These remarks, lifted from Mr. Harvey's stirring message, "Shadowboxing Can't Win," at the Coats off for Action luncheon at the AGA convention in St. Louis, put the problem of utility participation in the Gas Industry Development Program in a startlingly candid and forthright manner calculated not to win friends, but to get directly to the heart of the matter.

Must we continue to ask such questions as these:

Why were half the gas ranges sold last year at $150 each, or less? (And that, in the face of Sears-Roebuck promoting, advertising and selling a $400 *electric* range!)

Why are water heaters sold at such ridiculously low prices? There were a whale of a lot of 20-gal. water heaters sold last year at $25—and less!

And listen to this one. I want you to know that the manufacturers are a part of this problem, too. Pacific Coast water heater manufacturers sold 5% more water heaters last year than they did the year before for *5% less total take.* That figures to just about a *10% lower average price*—while *costs were increasing all along the line.* And the East Coast manufacturers aren't much better off.

And why are complete and fully automatic forced-air furnaces, winter air conditioning units, selling at *under $100?*

Why are we satisfied when the majority of gas appliances are sold on a price basis—with no margin for profit or promotion?

Why do we sell the gas itself at the give-away prices we do? Sure, I know gas prices are regulated, but I am sure there are ways of doing a bigger and better job at a higher price.

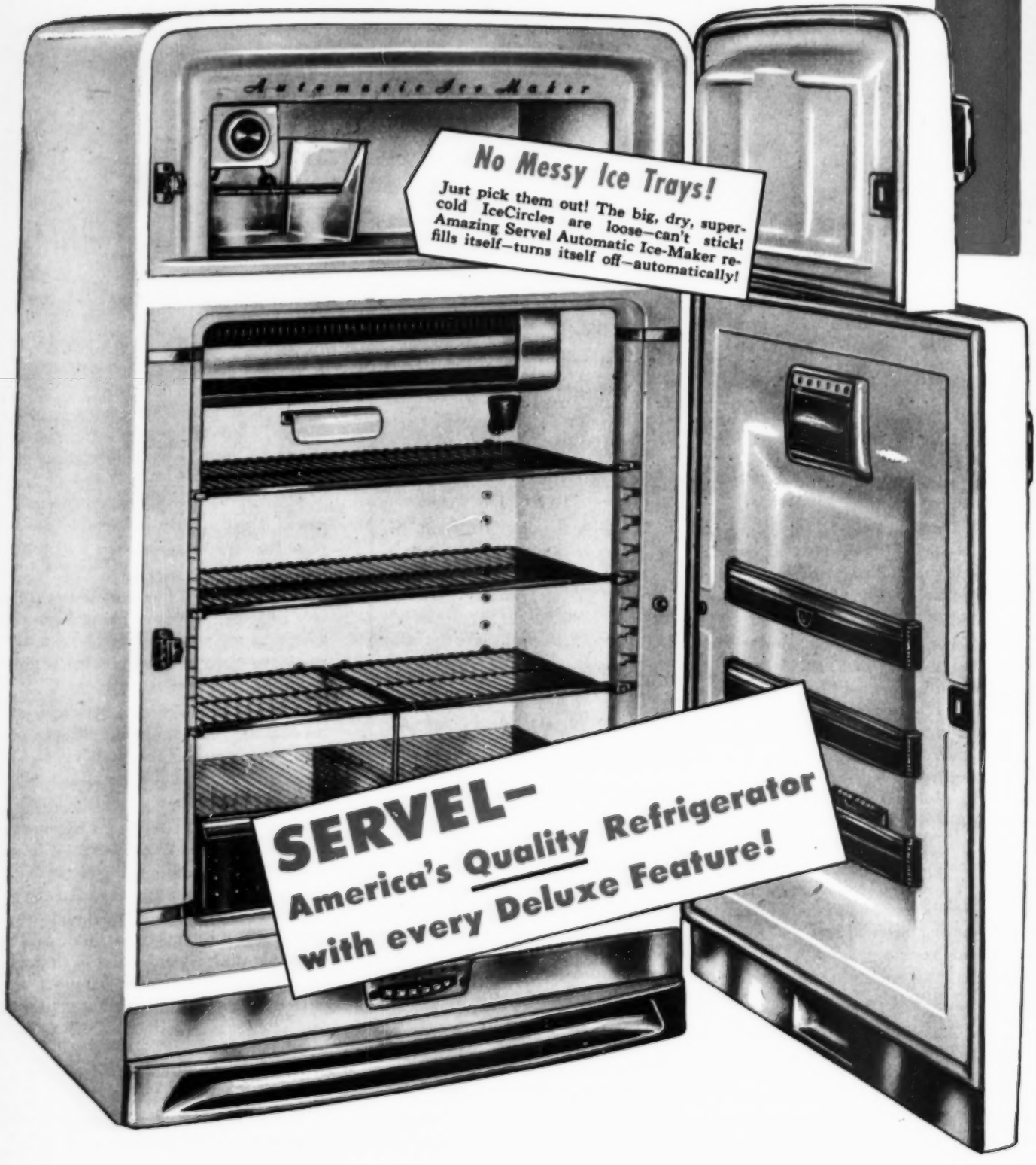
Why are we satisfied to believe, just because we have had limitations on gas space heating, that the public will quickly take additional gas away from us whenever we have it?

Why are some utility companies satisfied to suddenly release 1000—5000—10,000 additional gas space heating jobs, and then as suddenly clamp restrictions back on—knowing that such a short-sighted attitude automatically destroys any ideas or desires the manufacturers, the distributors, or dealers have for setting up for efficient and economical production and distribution.

Why have we permitted all these conditions to develop?

Gentlemen, we are *much too complacent* about the problem . . .

INCREASE YOUR KITCHEN GAS LOAD


Automatic Ice Maker
No Messy Ice Trays!
Just pick them out! The big, dry, super-cold IceCircles are loose—can't stick! Amazing Servel Automatic Ice-Maker re-fills itself—turns itself off—automatically!
SERVEL—
America's Quality Refrigerator
with every Deluxe Feature!

WITH Servel

ONLY REFRIGERATOR THAT MAKES ICE "CUBES" WITHOUT USING TRAYS—AND PUTS 'EM IN A BASKET—AUTOMATICALLY!

Just as this brilliant new kind of refrigerator keeps ice "cubes" constantly at finger tip for the lucky owner... so too does the new Servel maintain a constant gas load. Gas consumption is as automatic as the amazing automatic ice-maker.

The new *gas* Servel has one of the greatest sales stories and reasons for ownership of any appliance... no moving parts in the freezing system! No motor to wear! A full 10-year warranty—a product pledge unequalled anywhere in the industry.

HERE ARE THE FEATURES HOUSEWIVES WANT— FOUND ONLY IN SERVEL REFRIGERATORS—

- **Ice "cubes" without using trays**—automatically!
- **Separate freezer compartment**—up to 80 lbs.!
- **Automatic defrost**—completely carefree!
- **Butter keeper**—full pound at right temperature!
- **Adjustable shelves**—more storage space!
- **Door shelves**—roomy, wide, convenient!
- **Trip-saver handle**—opens at a nudge!
- **10 year warranty**—no moving parts!
- **3 appliances in 1**—refrigerator, freezer, ice-maker!

TIE IN WITH THE GREAT NEW SERVEL ADVERTISING DRIVE NOW!

Servel

The name to watch for great advances in
REFRIGERATION and AIR CONDITIONING

Servel Inc., Evansville 20, Indiana
In Canada, Servel (Canada) Ltd., 548 King St. W., Toronto, Ontario

MAIL THIS COUPON FOR FULL INFORMATION TODAY!

Servel, Inc., Dept. GI
Evansville 20, Indiana

YES! I want to be one of the first to get the facts about the new Servel program for 1954! Have my distributor contact me right away!

Name _____

Address _____

City _____ State _____

We are not sufficiently *dissatisfied* with the job that's being done. Listen to this classic example:

Two years ago, when I referred to electric cooking competition, one of my utility friends said, "Electric cooking? Why, think nothing of it! We get 99% of the residential cooking load. The electric people only sold a couple hundred ranges on our lines this last year."

3,000 ranges in one year

A few months ago—two years after the comment I just related—I talked to this same man again and raised the same question. He said, "Well, this past year there were only 3000 electric ranges sold in our territory, and that's not a very big percentage of the total ranges sold."

Imagine that! A couple of hundred, two years ago—*three thousand* this past year!

What this year—next year—5 and 10 years from now? Will he or his successors show the same relative complacency?

I tell you, there just isn't enough dissatisfaction with what we are doing!

Most of these gas company presidents have agreed that GID is a sound program. They say it's a wonderful idea, but that it's nothing new—that they've been operating and putting into practice the 15 points of GID for many, many years.

Now, I ask you, how could that be? If everybody is doing everything that's recommended by the 15 points, how could we be faced with all the troubles I have mentioned?

There *is only one answer!* We are *not* doing *everything* that's recommended, *in the way it ought to be done!* And unless we acknowledge this basic fact and *do something* about it—we just won't accomplish much.

Someone says, "Well, what's wrong?"

When we complain that we can't sell gas clothes dryers because they are priced higher than electric dryers . . . then I think something is wrong.

When a utility uses an appliance markup to arrive at its selling price that is substantially higher than the 40 to 50% usually used by the good dealer . . . then I think something is wrong.

When a utility goes out of the direct selling business because of the complications of selecting the appliances they will sell and/or the complications of the selling process . . . then I think something is wrong.

. When a utility sells, or helps to sell, 500 fully automatic ranges and at the same time permits 5000 of the lowest priced ranges that can be made to go into new housing developments in its area . . . then I think something is wrong.

When the only justification for the purchase of a gas appliance is its price . . . then I think something is wrong.

When the utility wants better appliances sold in greater volume, and wants proper public relations and thinks they can just turn these jobs over to somebody else and forget them . . . then certainly there is something wrong.

It is obvious, gentlemen, that the *complete* answer to our problem is not to be found in those factors I've already talked about.

With all that we have in fuel, product, and programs, we are not taking fullest advantage of our opportunities.

It's time we stopped this shadowboxing and brought into sharper focus exactly who or what our real foe is.

It's time we recognized that if all we've done over the years has not produced the results we have wanted, we must dig deeper and perhaps in other directions for the answer.

I have done just that, myself. And for the very reason I emphasized at the outset of this talk. Namely, because I regard myself as a member of the *one* and *only* team I know of—the gas industry team—combining *both* gas appliance manufacturers *and* the gas utilities. I have pondered this problem at very great length. Yes, and I've spent many sleepless nights analyzing and speculating on the many answers that have suggested themselves.

The answer is simple

After all the sifting, I am convinced that I have arrived at an answer to our basic problem. Unfortunately for you and me, the answer is not a startling one. Many of you have undoubtedly reached the same conclusion.

I am convinced that the problem and the solution is purely mental—psychological!

Simply stated, it is my firm conviction that the greatest weakness of the gas industry and the major *obstacle* to its progress are the *men* who have allowed their *minds* to stagnate—to suffer from *immobility!*

When gas company "A" does an outstanding job while gas company "B" with identically the same conditions of Fuel—Markets—Products—Plans remains on "dead center" or perhaps even slips back a notch or two—or permits competition to make unwarranted progress—there is generally *only one* major difference. Somewhere along the line—probably at the top of the gas company management bracket—that difference will be found in a *man* whose *mind* has been *motivated* either to intense action and stimulation, or to complacency and stagnation.

Gentlemen, the choice is yours. It is just as simple at that.

What would you do?

- *Painter is coming today to paint kitchen. Customer requests that serviceman call at 9 a.m. to shut off gas meter and disconnect range and return at 3 p.m. to reconnect range and turn on gas meter.*

3 companies would refer customer to a plumber.

2 companies would refer customer to a plumber. If the customer could not get one, company would comply with the request and charge the customer.

3 companies would shut off and turn on the meter, but would refer to a plumber for disconnecting and connecting range.

1 company would comply for a.m. and p.m. but not for specifically 9 a.m. and 3 p.m.

The service policy rule book doesn't always give the answer to whether, when, or how unusual service requests should be handled by utilities. The 10 companies who provide their own answers here are PCGA member utilities; the problem was one of 35 posed by H. E. Benninghoven, San Diego Gas & Electric, in a survey reported at the PCGA customer service conference, Fresno, Calif., March 18.

NBS lab corrosion tests yield 10-year field data in six months

RELIABLE data on the corrsion of ferrous metals in soils of various types can now be obtained in the laboratory in a period of six months. Usually field tests lasting 10 years or more are required.

In an investigation at the National Bureau of Standards, conducted by W. J. Schwerdtfeger of the corrosion laboratory, corrosion was produced in small laboratory cells by differential aeration of metal disks in contact with soil within the cells. The results for 15 different soils showed good correlation with the corrosion observed on wrought specimens in long-term exposure tests. The technique used by the bureau should thus provide a valuable basis for predicting the service of iron and steel structures exposed to various soils.

Accessibility of oxygen

The corrosion of metals in many soils is attributed chiefly to differences in the accessibility of oxygen to the surface. Differences in oxygen concentration create differences in the potential of various areas, resulting in the flow of electric currents through the soil from the oxygen-deficient areas (anodes) to those areas (cathodes) receiving more oxygen. The laboratory corrosion cells used by NBS made use of this principle.

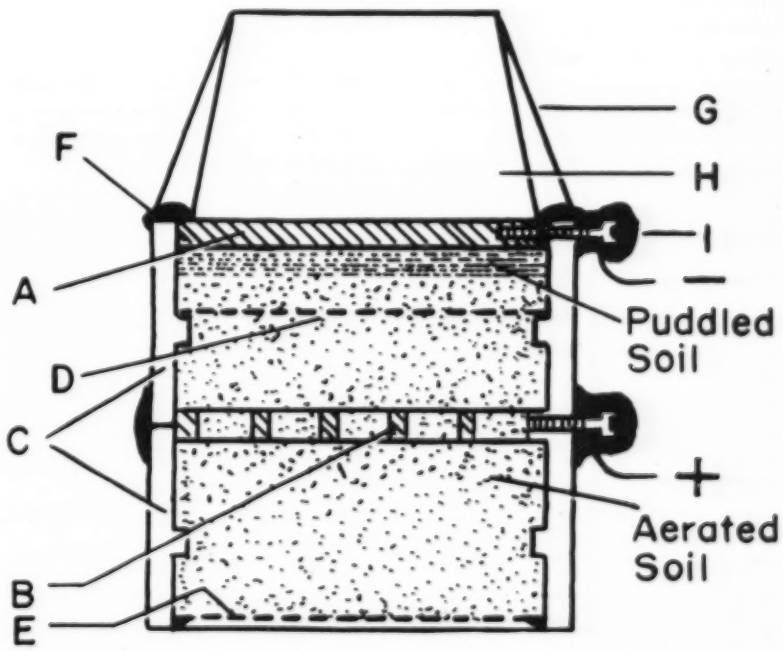
Each cell consisted of a cylindrical Lucite enclosure containing two short-circuited disk-shaped electrodes of the same material, iron or steel. One electrode was solid, the other perforated, and they were separated by a layer of moist soil. The edges and one face of each of the two electrodes were covered with bituminous paint. The layer of moist soil in contact with the coated side of the perforated electrode regulated the diffusion of air to the electrodes. The perforated electrode received a greater supply of oxygen than the solid one adjacent to which the soil was puddled, and therefore assumed a more positive potential.

Ferrous metals

If the corrosion of ferrous metals in all soils proceeded at a rate that was constant with time, weight-loss measurements made after a short arbitrary period of exposure should indicate relative rates of corrosion, assuming negligible cleaning errors. Actually, however, corrosion in soils may proceed at a rate proportional to time, or may sometimes cease entirely, depending on the type of soil. It was thus necessary to operate the laboratory corrosion cells for a sufficiently long period to produce effects comparable to those shown by field exposure tests.

In the NBS investigations, the corrosion cells were kept on short circuit for six months. During this time periodic measurements of cell current permitted study of the progress of corrosion with time. At the end of the period the combined weight losses of the two electrodes were taken as the measure of corrosion.

To evaluate the laboratory corrosion cell as a means for predicting corrosion in the field, samples of soil collected at 15 NBS exposure sites were used. The results were correlated with weight-loss measurements made on short lengths of steel and wrought iron pipe which had been exposed for 10 years at the same



Soil corrosion cell used by the National Bureau of Standards for laboratory measurement of the corrosion of iron and steel in various types of soils.

Transition to retirement eased by Peoples' education program

EMPLOYEES of Peoples Natural Gas Co. of Pittsburgh nearing the retirement age of 65 are benefitting from a new and comprehensive four-point retirement program the company has introduced.

The new program involves the holding of four meetings for employees past 60 years of age. Dealing with four different aspects of retirement, these meetings cover the philosophical, medical, economic, and case history phases of retirement.

Co-originators of Peoples' planned retirement program, Larry E. Ostrye, assistant to the president, and Charles V. Hoey, assistant personnel director, said that the plan has the general goal of building, for the prospective retiree, "confidence in facing a future built on a sound and optimistic foundation."

Three principle objectives sought are:

1. To give each prospective retiree a picture of the various problems he may face when retiring.
2. To stimulate organized thinking toward suitable post-retirement interests and activities.
3. To generate some action on plans prior to actual retirement.

With these specific goals in view, the first meeting is designed to introduce future Peoples' retirees to the background principles and aims of the program. Group discussion deals with the nature of retirement, the development of a healthy philosophy toward it, and encourages thinking along the lines of individual retirement problems.

The second meeting, conducted by Dr. W. F. McAnally, medical director for Consolidated Natural Gas Co., covers health factors relating to retirement. Discussion is centered on physical welfare and the establishment of a pattern of living for the older person.

Ray P. Froelich of Peoples' annuities and benefits section leads group discussion at a third scheduled meeting. Economic factors are the point of emphasis, with pension payments, social security legislation, the company retirement policy, and other matters of economic interest being explained and discussed.

The fourth meeting, which includes a review of what has been said and discussed in previous meetings, is given over primarily to a digest of recent Peoples' retirement case histories. Common pitfalls, as well as tips on sound and proved approaches to retirement, are highlighted by the case histories.

In addition, at the final meeting, each member of the prospective retiree group outlines his own general plans for retirement activities in the light of what he has heard at the four sessions. Assistance is also offered to the future retirees in the form of personal counseling by the medical or personnel departments.

Christy Payne believes that the retirement program will extend feeling of cordiality between Peoples and its retiring and retired employees.

Employees participating in the planned retirement program receive a booklet devoted to retirement subjects. Included are articles on retirement, explanations of social security legislation, and pictures and stories of retired employees and their hobbies.

Attendance at the meetings, held on company time, is voluntary, but early reports indicate that employees nearing retirement are all taking advantage of the aid offered in their behalf.

Christy Payne Jr., vice president of Peoples, said the company "has always been fortunate in having a close relationship with employees who have retired.

"We hope, through this new retirement program, to extend this feeling of cordiality between Peoples and its retiring and retired employees.

"If we can make the transition between the last working day and retirement easier, satisfactory, and more profitable for our retiring employees, we want to do it.

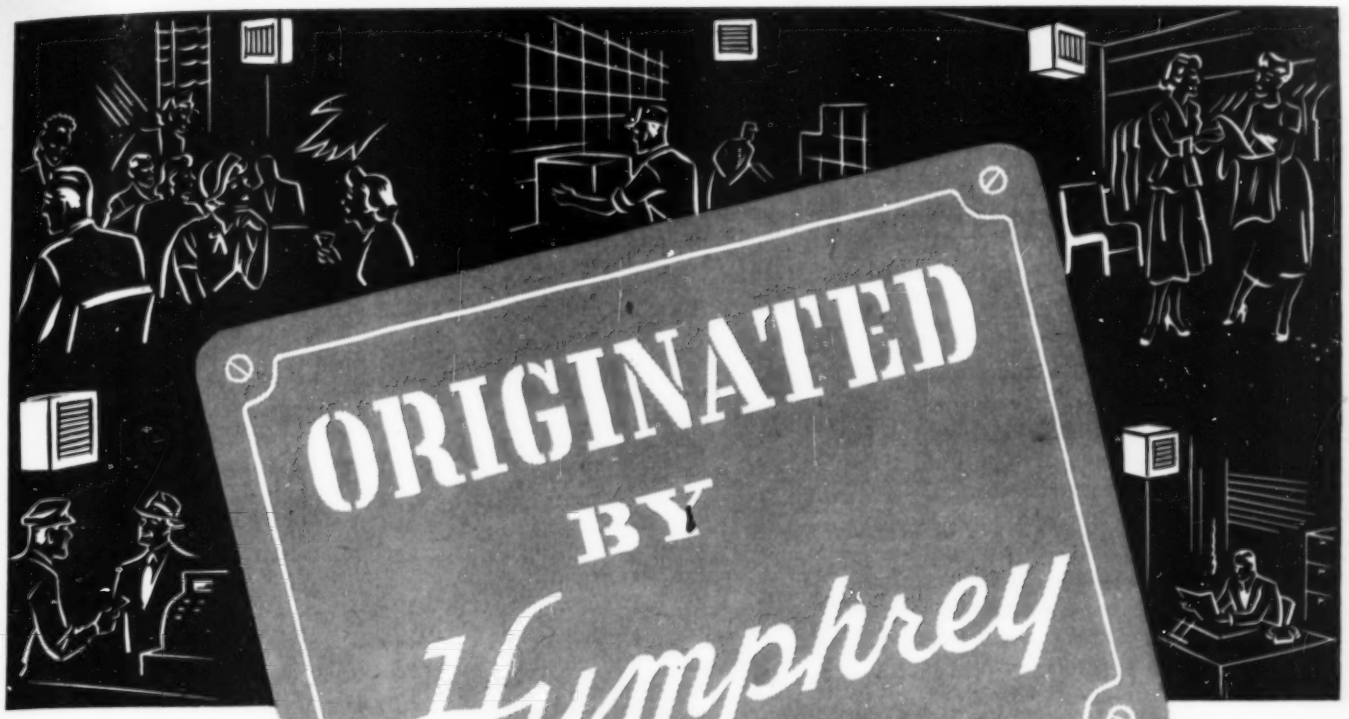
"That is the least the company can do," Mr. Payne summed up, "to reward them for long and faithful service, and we accept the responsibility."

15 localities. An empirical equation relating the laboratory and field data indicated that the laboratory measurements could be used to predict field weight losses with root-mean-square error of about $\pm$ 4 oz/ft^2 for corrosion rates ranging from 2.5 to 30 oz/ft^2 for the 10-year exposure period. Because the 15 soils covered the range of corrosivity of the soils of the United States, this empirical relationship may be applicable to any soil.

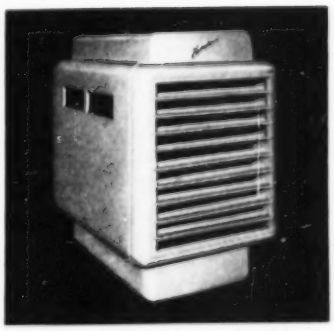
Failure by pitting

Because some underground structures, such as piping systems and storage tanks, usually fail as a result of pitting, this factor was also considered Analysis of the field data showed a good correlation between weight losses and maximum pit depths on wrought ferrous specimens which had been exposed for 10 years at 58 NBS exposure sites. These data were then combined with the first empirical equation to obtain a second equation which can be used to predict, with an average error of $\pm$ 18 mils, the depth of the deepest pits occurring on wrought iron or steel buried for 10 years. For the prediction of weight losses and maximum pit depths on areas greater than the area of the field specimens and for periods of exposure other than 10 years, use was made of general equations relating weight losses and maximum pit depths with length of exposure and exposed area. Average values for the constants to be used in these equations were obtained.

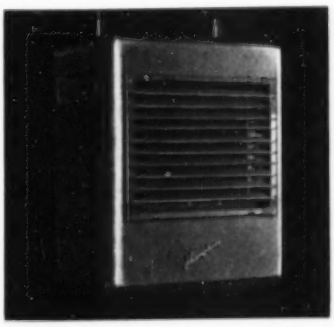
It was found that the corrosion cell could detect significant differences between the corrosion rates of cast iron and steel, which are generally considered to corrode at about the same rate in soils. Thus, the cell might be used to study the effects of variables, including composition upon the corrosion rates of steels. It is also reasonable to expect that laboratory corrosion cells could be used to predict the corrosion of nonferrous metals—copper, brasses, lead, zinc, and possibly aluminum—in various kinds of soils. Although measurements with the laboratory cell should not be considered as replacing field exposure tests entirely, it is unlikely that materials which corrode at the same rate in the laboratory would corrode at significantly different rates in the field. Hence, the corrosion cell should serve a useful purpose in the selection of materials for field exposure tests.



The invisible label on EVERY Gas Unit Heater!



Humphrey Series A Automatic Gas Unit Heater. Choice of Rotor or Propellor fan, 65,000 to 200,000 b.t.u.



Humphrey Model 40-G, compact Gas Unit Heater in 17" x 22⅜" x 13¼" cabinet. 40,000 b.t.u.

Twenty-five years ago, Humphrey, already a leader in producing gas heating equipment for the home, originated and marketed the first Gas Unit Heater for business and industrial use.

In the years since, Humphrey engineers have led the way in developing improvements in design and construction required to meet ever higher standards of dependability and efficiency.

Heat exchangers with unrestricted, non-baffled interiors, for service-free operation without cleaning—stainless steel burner heads that increase service life and eliminate up to 100 lb. of dead weight—non-clogging pilots that operate dependably even under unfavorable conditions—all these and many other features have been Humphrey developed, on the basis of Humphrey experience.

Today Humphrey continues to lead in providing the refinements of construction that assure top efficiency and dependability.

Now as always, it is good business to make the Humphrey Gas Unit Heater your first choice. When you install a Humphrey you can be sure you are putting in the newest and the best.

GENERAL GAS LIGHT COMPANY

KALAMAZOO, MICHIGAN

"big news"

Labs expand as testing and research activities hit record-breaking levels

RESPONDING to the continuing growth of the gas industry, gas equipment manufacturers submitted record-breaking numbers of new and modified appliance models to the American Gas Assn. Laboratories for approval tests during 1953. More than 75% of the Laboratories operations were devoted to appliance testing services and inspection of approved production units at the manufacturers' plants. Testing operations were nearly 50% above the 1952 level and approximately 20% above the previous peak established during 1950.

Greatest activity occurred in the testing of central heating gas equipment, which continued to account for over 50% of the volume. Central furnaces for installation in closets and alcoves and the counterflow type were submitted in larger numbers than heretofore. Marked increases were also witnessed in the number of new domestic gas clothes dryer and gas incinerator models together with an increase in the number of new manufacturers entering the gas equipment field for the first time.

To keep pace with the rapid growth in testing services, especially in house-heating equipment, contracts were awarded for construction of a 17,800 sq ft north wing building addition to the Cleveland laboratory.

Work on new offices for the Laboratories director and his staff, and the standards, methods and clerical departments was started in the fall in the recently erected south wing addition to the Cleveland laboratory. These improved office facilities are expected to be placed in use early in 1954. They will include an improved and enlarged meeting room which will provide adequate accommodations for industry meetings with larger attendance than heretofore, as well as free areas in the main building for the expansion of the appliance testing, inspection and research departments.

Thirty-nine meetings of the approval requirements committee and its sub-committees were held throughout the year to revise the appliance approval and accessory listing requirements in line with the rapid technological strides made in appliance design. Approximately 525 industry representatives attended these meetings, representing over 5500 man-hours devoted to the preparation of the industry's appliance standards, exclusive of preparatory and clerical time. Revisions to seven appliance standards were adopted by the approval requirements committee and approved as American Standards. These revised standards cover domestic gas ranges, room heaters, water heaters, clothes dryers, incinerators, unit heaters, and vented recessed heaters.

A number of methods investigations were conducted by the Laboratories in order to obtain up-to-date information on contemporary appliances. These studies, together with the experiences of the industry's representatives formulating appliance standards, form the basis for future revisions to the requirements and test methods employed. Subjects studied included range top burner ignition, revised draw-off tests for water heaters, strength of aluminum and brass valves, comparison of test methods for measuring deep fat fryer performances, and others.

Throughout 1953, 21 research projects were studied in the domestic, industrial, commercial, and gas production fields. In the domestic field, studies included gas cooking, water heating, heating and air conditioning, incineration, and general gas utilization. Although most of these projects are scheduled for completion during 1954, a number of preliminary reports have been prepared and are under review by sponsoring committees.

Two research reports were published by the Laboratories, outlining preliminary phases of findings covering these subjects:

"Secondary Aeration of Atmospheric Gas Burner Flames; Part I, Preliminary Exploration of Methods." Research Report No. 1204.

"A Review of Literature on the Results Obtained by Mixing Varying Amounts of Oil with Industrial Gases Before Combustion at Elevated Temperatures."

In the field of cooking research, new experimental top burners and pilots, oven and broiler sections incorporating new and contemporary burner and pilot designs, and improvements in ignition and control features have been developed which are expected to result in major improvements in the performance of domestic gas ranges. Tentative plans call for display of these experimental units to gas company and manufacturing company executives and technical staffs for information and consideration in the near future.

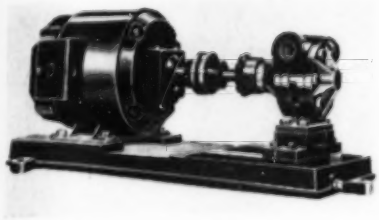
Ground has been broken for the newest addition to the Cleveland Laboratories, the north wing. To be erected at a cost of $200,000, the wing will be devoted to the testing and pending-approval storage of central heating equipment.

The north wing addition has been designed to harmonize with the architecture of the recently erected south wing addition. It will provide an unloading dock for incoming appliances, releasing the present dock for shipments only. The basement is to be utilized for storage of appliances awaiting approval tests. The first floor, to be devoted exclusively to approval testing of central heating units, will be 1½ stories in height and incorporate a mezzanine of 900 sq ft for eventual expansion of administrative facilities. Land adjoining the north wing structure has been purchased and developed into enlarged and improved parking facilities.

Gas piping for the north wing will provide for 23 additional appliance testing stations, each of which will permit tests to be performed on natural, manufactured, and mixed gases as well as undiluted LPG and L. P. gas-air mixtures.

New Products and Trade Literature

To secure further information on products or new literature, simply fill out the coupon and mail, indicating by number the information or literature needed.

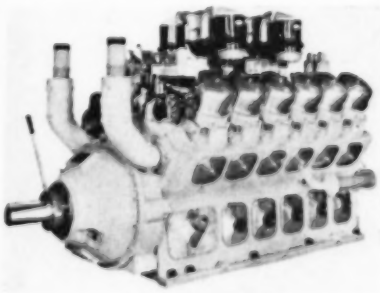


1 Roller Type Pump

A recent addition to the Eclipse line of equipment is a direct drive, roller type pump for handling liquids with lubricating characteristics. It operates at higher speeds with the same liquids than more tightly fitted mechanisms. Liquids containing foreign matter can also be handled efficiently without damage, and are handled without sacrificing suction and pressure characteristics. The continuous circulation of liquid reduces the effects of cavitation and permits operation at higher speeds than with other positive displacement designs. The pump is designed primarily for use with the new Eclipse "CF" closed flame gas-oil burners.

Eclipse Fuel Engineering Co.

■



2 Internal Combustion Engine

A new V-12 valve-in-head, internal combustion engine, the L4000, has been added to the Le Roi Co.'s line of internal combustion engines for use in the petroleum industry and wherever heavy sustained loads are encountered. The new model has 4000 cu in. piston displacement and will develop 635 hp at 1200 rpm with accessories. The L4000 is designed to burn natural gas but may be equipped to burn liquefied petroleum gas, sewer gas or gasoline. It has removable wet type cylinder sleeves; individual cylinder heads are removable without disrupting intake and exhaust manifolds. The engine also has hardened steel valve inserts, "zero lash" hydraulic valve lift, water cooled manifolds, full pressure lubrication and modern cam ground aluminum pistons.

Le Roi Co.

■

3 Appliance Regulator

A new gas appliance pressure regulator is now available from S. H. Leggitt Co. For natural, manufactured or mixed gases, this regulator, used with a pilot filter, is designed to end pilot outages caused by filtering and regulating problems. One of the smallest regulators on the market, it is designed for ease of servicing and installation. Overall height of the ¼-in. and ⅛-in. models is 2⅛ in. Width is 1 13/16 in. Its small size makes it advantageous for installation where working room is at a premium. Body is pressure cast aluminum alloy. Internal working parts are made of machined brass.

S. H. Leggitt Co.

■

4 Incinerator Flue

The Monarch safety flue, manufactured by P.B.R. Metal Products Inc., has been designed for use with gas-fired incinerators.

The prefabricated flue can be used in existing buildings or installed in buildings under construction and can be installed inside the walls or against the outside of the building. It is pre-assembled in four sections with S clips and drives to make positive airproof joints.

Two models are available. One, the MC-8, has a 6-in. vitreous, high heat enameled liner enclosed in an 8-in. outer casing, providing a free flow of cold air surrounding the main flue. The other, MC-10, features an additional 10-in. casing, providing a second air space.

Special adapters are available for all makes of gas-fired incinerators.

P.B.R. Metal Products Inc.

■

5 Service Bodies

The Utility Body Co. is now in full production on a new, improved line of service bodies for the public utility and other industries. It turns out standard service bodies for ½-, ¾-, and 1-ton truck chassis, and construction units for 1½-ton and larger

Mail this Coupon for **NEW PRODUCTS INFORMATION**

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FISHER® TYPE 66

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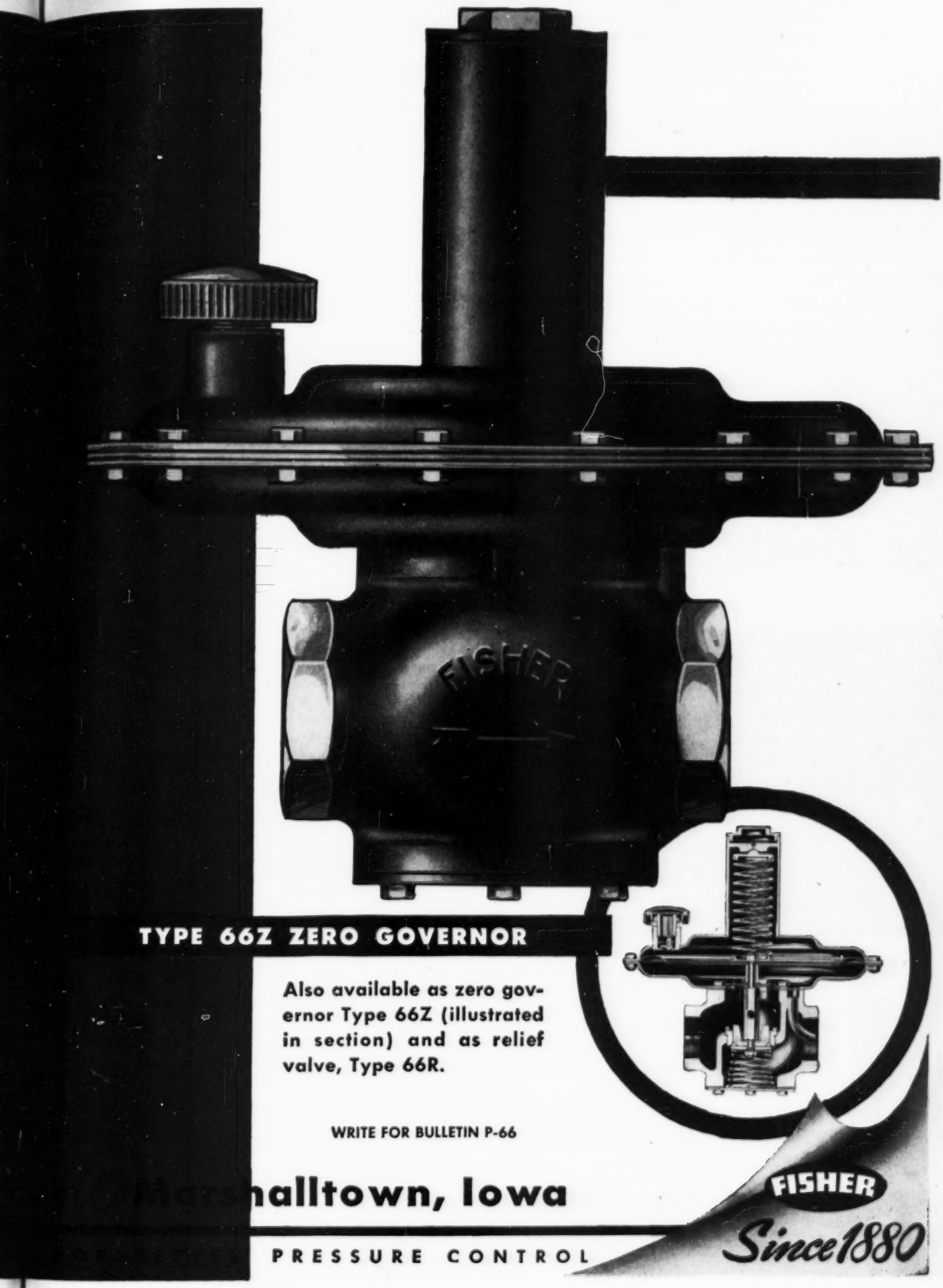

TYPE 66Z ZERO GOVERNOR

Also available as zero governor Type 66Z (illustrated in section) and as relief valve, Type 66R.

WRITE FOR BULLETIN P-66

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PRESSURE CONTROL

FISHER

Since 1880

chassis. Designs incorporate suggestions from operators in service and maintenance fields.

Model S-48 service body (shown) features a 48-in. bed width. It is also available with sliding cover and end-gate enclosure. Flush, pull-out type door handles with slam action catches and master keyed cylinder locks are used. The body has an anti-buckling, heavy duty corrugated steel floor with drainage outlets. Top panels are ribbed for added strength. Buyer has choice of side angle or overhead type ladder rack as standard equipment. If neither is required, cost is deductible. Model S-48 has a body length of 90 in.

Utility Body Co.

6 First Aid Kit

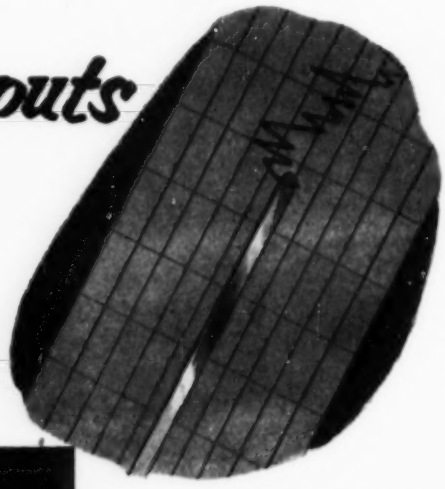
First aid supplies of "pharmaceutically controlled quality" in a redesigned case are features of Mine Safety Appliances Co.'s new Type D first aid kits. A rigid system of quality control makes it possible to trace every item in the kit to its origin. Individual packages in the kit feature simplified, fully illustrated instructions in large, clear type. Labels on antiseptics are printed in different colors to help avoid confusion. Bandages have been redesigned for greater ease in use and neater appearance.

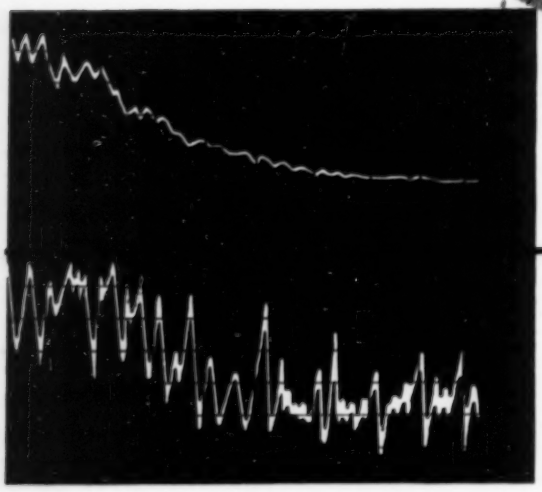
When the lid to the kit is open, unit packages extend above the base about ½ in. for quick removal. A tubular rubber gasket around the inside edge of the base of the kit makes a tight seal when it is closed. Wall mounting brackets are designed to lock against the case when not in use and to be "non-flapping" when the kit is mounted in a vehicle.

Mine Safety Appliances Co.

■

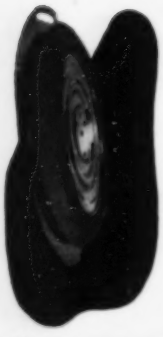
Lancaster puts the finger on friction





Cardiograph Reading On New Lancaster Metal Rim Diaphragm indicates no points of excess friction—uniform distribution of leather, perfect alignment of center pans, ideal weight and stiffness of leather, and proper amount of oil in leather.

Cardiograph Reading On New Diaphragm of Another Make (as received in proof) indicates excess friction. If installed in this condition, diaphragm would come in from 5% to 10% fast. (Diaphragm was later found to have non-uniform distribution of leather and center pans improperly aligned.)



Typical of Lancaster's leadership is the cardiograph designed by our engineers. It was extensively used in the development of Lancaster's new groove type metal rim diaphragm which has made such a hit with meter shop men.

Accurately checking differential of pressure under actual meter operating conditions, this cardiograph has put the finger on factors influencing diaphragm performance . . . and has helped determine the important new features found in the new Lancaster S-7 groove type diaphragm.

If you are not already using the new Lancaster groove type metal rim diaphragm for your small meter repairs and replacements, send for literature and prices today.

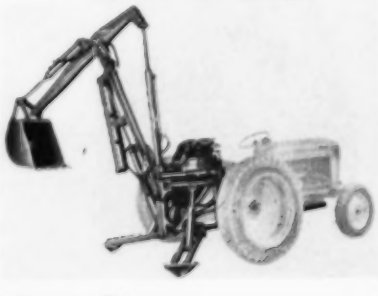
METER PARTS CO.

7 Air Conditioning Unit

Two new 1954 summer air conditioning units were introduced recently by Bryant Heater Div., Affiliated Gas Equipment Inc. They are redesigned, stylized, highly efficient, full rated room cooler (shown) and a compact, light weight duct air conditioner. The room air conditioner, Model 554, has improvements in cooling efficiency, dehumidification and quietness of operation. It is housed in an Ivy-Tone room cabinet to blend with room furnishings. More flexible operating controls provide four adjustments of room climate. Controls are concealed beneath a small door on top of the cabinet and overhang into room is reduced to 3½ in. It features complete hermetic compressor, a large condenser coil, and double and triple row cooling coils with maximum cooling area. The duct air conditioner, Model 581, is designed for quick, easy installation in restricted attic, basement, or crawl space locations.

Bryant Heater Div.

■



8 Power Diggers

The latest models of Sherman hydraulic power diggers combine design and engineering advancements to give extra performance,

"SALES CLINCHERS" FOR GAS RANGE SALESMEN
No. 5 of a series

To sell her the *GAS* range, show her *COOL COOKING* with...

ALLTROL® *Center Simmer**

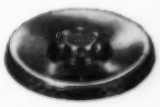
You're offering her *more comfort* . . . cooking in a kitchen up to 9° cooler. A big selling point any time is no wasted heat. *Show* her why! The small Center Simmer keeps food at top cooking speed with a flame that heats the pan, not the air around it!

ONLY **ALLTROL** BURNERS HAVE A *COMPLETE* HEAT CYCLE

Full flame Starting Burner for quick boil or fast frying.

A full range of intermediate heats when wide spread of heat is needed.

Click . . . here's efficient "Center Simmer" that maintains boiling in any covered vessel.



Click . . . a gentle "Keep Warm" heat . . . without further cooking.

* *Write for names of ranges featuring ALLTROL Center Simmer.*

® *Trade Mark Reg. U.S. Pat. Office*

SEND FOR FREE BOOKLET,
"How to Sell More Gas Ranges"
Address Dept. 14G

HARPER-WYMAN COMPANY

8562 Vincennes Avenue Chicago 20, Illinois

"ALLTROL CENTER SIMMER" MAKES GAS THE WINNER!

greater economy and durability. Major improvements include the dipstick which is now of fabricated box construction and available in two sizes for depths of either 8 or 10 ft. The safety factor has been increased. Booms have been reinforced to nearly 100% greater bearing surface at hinge points on the dipstick and swing frame. A redesigned swing control system provides better throttling control and smooth action as fast or slow as operating conditions require. Hoses with double wire braid for maximum assurance against failure are now standard equipment, and a new hose arrangement reduces the possibility of chafing and cramping.

Sherman Products Inc.

Trade Literature

9 Control System Catalog

A new, greatly expanded catalog of complete control systems for furnaces, ovens, dryers and kilns has just been published by the Bristol Co. It contains detailed engineering specifications and prices necessary to select the proper control "package" for a particular installation. Several models of the Electronic Dynamaster potentiometer and millivoltmeter type pyrometer controllers, recorders and indicators, as well as bulb and tubing recording or controlling thermometers, are described and pictured. Electric control relays, motor operators and controllers are included in addition to electric and air operated control valves. More than 100 photos and application and dimension drawings illustrate the 48-page bulletin.

Bristol Co.

■

10 Plastic Pipe Booklet

Republic Steel Corp. describes its newest product in a catalog, "Republic Plastic Pipe." The 12-page, two-color booklet tells why Republic entered the plastic pipe field, describes the two principal types of plastic pipe made, shows how to join plastic pipe and lists various engineering and corrosion data.

Republic Steel Corp.

■

11 Temperature Control Bulletin

Minneapolis-Honeywell's new 077 electronic temperature controller with range now extended to cover — 100° to + 600° F is described in a new bulletin. It contains complete specifications, prices, and application information on the controller in both the single-point and the new cascade model, and data on resistance thermometer elements and wells, and Modutrol motors and industrial control motors suitable for use with the new 077.

Minneapolis-Honeywell Regulator Co.

■

12 Pavement Breaker Booklet

Ingersoll-Rand has prepared a new bulletin listing its complete line of tools and accessories for paving breakers. The two-page bulletin illustrates each tool and lists its recommended applications with a table of weights, sizes, etc. It also contains a page giving specific instructions for reforging and rehardening moil points, chisels, wedge points, etc. Instructions include procedure, specific temperature and temperature colors.

Ingersoll-Rand Co.

■

13 Separator Catalog

A new separator catalog describes Anderson Line Type Hi-eF Purifiers and their many uses. The catalog contains charts which simplify the selection of purifiers and enable the user to select quickly the size purifier that will give the greatest efficiency at various flows and pressures. It also includes diagrams, tables of dimensions, weights and other buying information.

The folder discusses the removal of entrained moisture and scale in steam to turbines, reciprocating engines, and regulating engines, and regulating valves; oil, dirt, condensate, etc., from exhaust steam; condensate from compressed air lines.

V. D. Anderson Co.

REYNOLDS HIGH PRESSURE LINE REGULATORS in parallel hookup have an increased range of capacity as well as a wider range of delivery pressure control. This also provides greater margin for emergencies. On inlet pressure the range is up to 650 pounds. For outlet pressure, this unit assures absolutely accurate and dependable control from 2 to 100 pounds. This variance in outlet pressure is made by use of different sizes of diaphram cases and further flexibility in the spring type is possible by use of different strength springs.

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2nd Unit, Santa Fe Building
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Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

TWO GREAT NAMES...

THE SHERATON-CADILLAC
DETROIT, MICHIGAN
One of the world's great hotels!

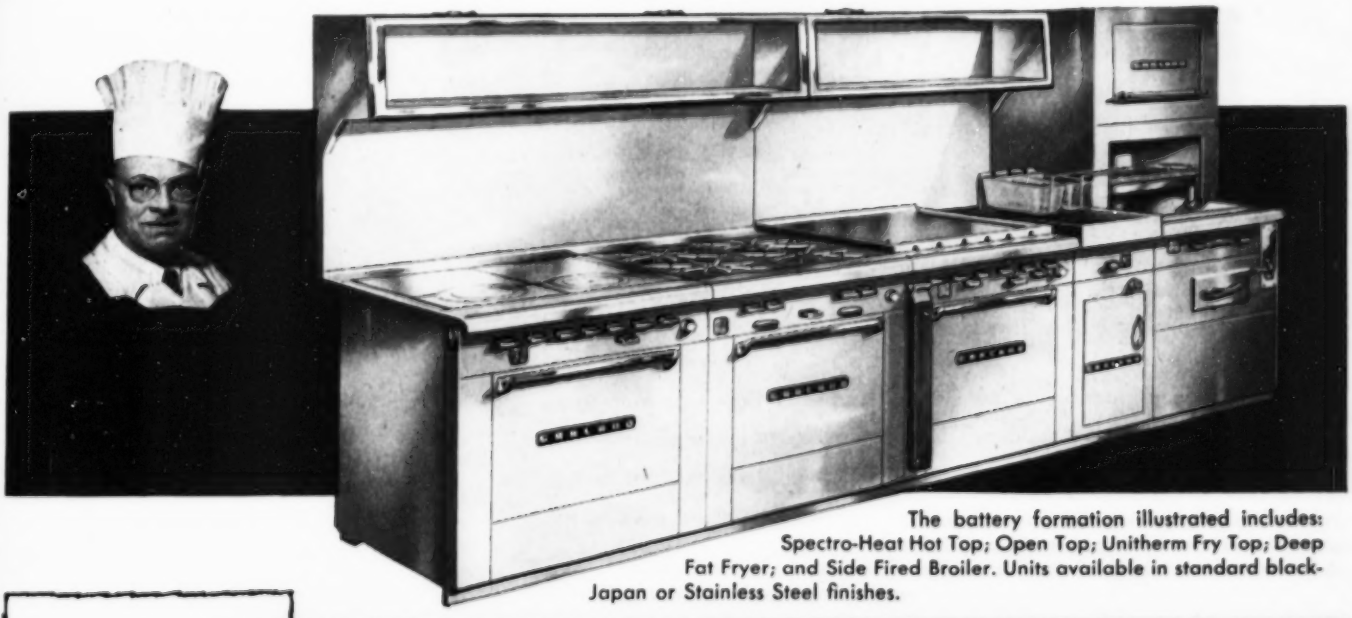
Equipped with

GARLAND

THE GREATEST NAME IN COMMERCIAL COOKING!

FAMOUS NAMES IN COMMERCIAL COOKING FROM COAST TO COAST DEPEND ON GARLAND!

Independent surveys prove again and again that Garland Commercial Cooking Equipment has more installations in leading hotels, restaurants, clubs, schools, and institutions than any other make! The reason is simply that men who know, *prefer* Garland quality, durability, dependability, and economy of operation. Phone, wire or write for full details!



The battery formation illustrated includes: Spectro-Heat Hot Top; Open Top; Unitherm Fry Top; Deep Fat Fryer; and Side Fired Broiler. Units available in standard black-Japan or Stainless Steel finishes.

Have you joined the 45-29 Club?

DM PRODUCTS

Heavy Duty Ranges • Restaurant Ranges • Broiler-Roasters • Deep Fat Fryers
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PRODUCTS OF DETROIT MICHIGAN STOVE CO., DETROIT 31, MICHIGAN
IN CANADA: GARLAND-BLODGETT LTD.—1272 Castlefield Ave., Toronto

Thermally Thinking

Continued from page 30

Senate Minority Leader Lyndon Johnson (D.-Texas) is likely to take up the cudgel for legislation similar to the Kerr Bill. The older Kerr Bill passed the Senate by 44-38 and the House by 176-173, but the Democrats then were in control. Since the Republicans depend for the majority of their votes in the very areas in which gas consumers have increased the fastest, it seems extremely unlikely that the legislation could be forced through, despite powerful pressure that undoubtedly will be engendered.

It seems very likely, too, that President Eisenhower, who this year is determined to woo the consumers, would veto any new Kerr-type legislation on this subject.

As of now, it seems evident that the political tendency is to put off final action on any legislation to reverse the Supreme Court. This means that the FPC, whether its dominant members wish to or not, will have to move forward on the regulatory front in 1954. If ultimate legislative correction appears hopeless, the outlook in the industry is to separate and divorce oil and gas properties by present joint producers and gatherers. A lot of these producers have had escape clauses in their contracts with pipelines, cancelling them out should there be FPC jurisdiction. But lawyers here say that enforcement of such clauses is both impracticable and of doubtful legality under present circumstances.

An assist from Interior

The Department of the Interior intends to step up cooperation with private industry—particularly the coal industry—in the development of commercial fuels from oil shale and gas synthesis, Secretary of the Interior Douglas McKay has told the National Industrial Conference Board in a formal speech.

Although Interior's own active program in this field was eliminated by Congress in the current appropriation for the department, Interior will take part in joint projects with industry to assure that the $80 million spent by previous administrations on developing liquid fuels from coal will not be wasted.

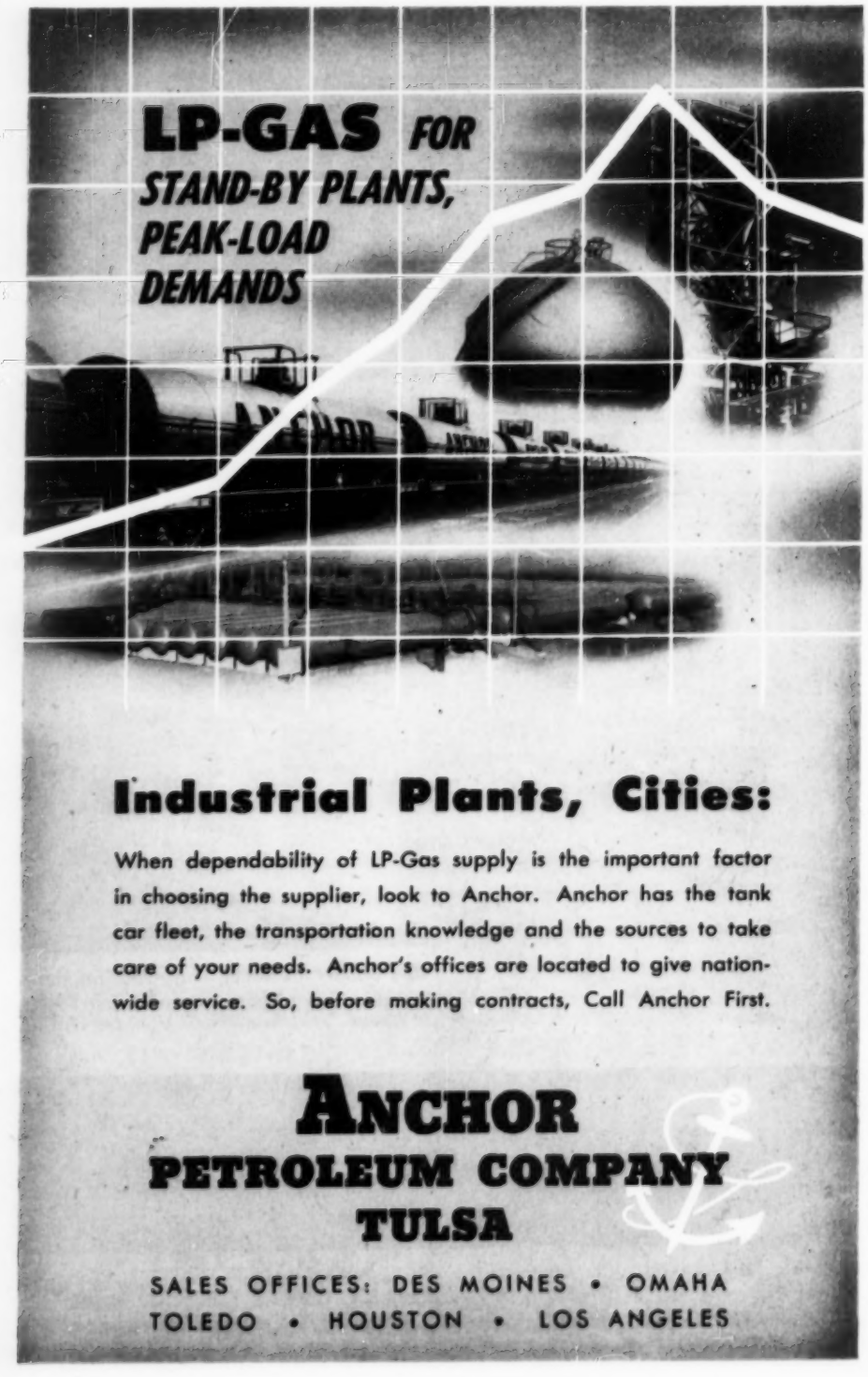
Secretary McKay said he believed that the work conducted at the coal hydrogenation plant in Louisiana, Mo. proved that the basic research was sound, but that it had reached a point of diminishing returns and was costing Uncle Sam $10,000 a day to operate.

The Secretary said that offering the fruits of its research to private industry is in line with new administration policy and that he did not think that additional federal research would be able to do anything that private industry could not do faster and much more economically.

Utilities will keep tax write-off benefits

Congress did *not* intend to deny to public utilities, including the natural gas industry, the benfits of fast tax write-offs granted to other industries, the Federal Power Commission has decided in a four-to-one policy opinion issued here.

At the same time, Office of Defense Mobilization here has announced the


LP-GAS FOR
STAND-BY PLANTS,
PEAK-LOAD
DEMANDS
Industrial Plants, Cities:
When dependability of LP-Gas supply is the important factor in choosing the supplier, look to Anchor. Anchor has the tank car fleet, the transportation knowledge and the sources to take care of your needs. Anchor's offices are located to give nation-wide service. So, before making contracts, Call Anchor First.
ANCHOR
PETROLEUM COMPANY
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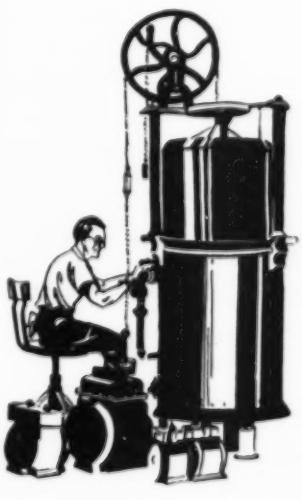
closing of 120 defense expansion goals, but has left open some 68 goals, including those for natural gas pipelines. The ODM invites applications for fast tax write-offs in this field (and in the other open lines).

The FPC majority (Commissioner Dale E. Doty dissented) makes two points very clear in this controversy as to whether any temporary tax savings should be diverted either to ratepayers or shareholders: (1) that Congress did not intend to make cash donations to persons who happen to be utility customers during the five-year period of abnormal tax deductions for depreciation, and (2) that "Congress did not intend to provide a temporary fund to these companies which could be diverted to the payment of dividends." The FPC majority thus clearly indicated what it thinks should be done: "Accruals for taxes in excess of those actually paid should logically be treated, not as free and unrestricted income, but earmarked to provide for the future meeting of such liability."

A procedural rule, dealing with the accounting phase in harmony with these majority views, may be expected to be forthcoming. There will be no appeal from the majority opinion, since FPC merely was expressing its opinion on policy and procedure.

Although the "public ownership" groups have protested that the FPC ruling means a "windfall" to utilities running into the billions, the FPC majority views are likely to prevail without court review. The state commissions, of course, are not bound to follow FPC policy in this respect, although some of them undoubtedly will and all of them will be influenced by it to some extent.



"YES! We made HEATH Leakage Control Surveys of some 500 gas properties during 1953."

"YES! ... they were more than pleased with the results ... especially with the reports as to *accuracy* of leak locations and the *classification* as to size and importance."

"YES! ... that neighboring Gas Company was one of the 500 and we certainly appreciate their telling you about our work and recommending us so highly."

"YES! ... they agree that nothing but the *best* will do when it comes to AUDITING your Gas Leakage conditions."

"YES! ... I certainly advise you to use our Over-All Heath Leakage Control Survey ... especially if, up to date, you may have been using only *one phase* of our complete Survey Service."

You too can save thousands of dollars worth of gas annually ... reduce insurance problems by reducing hazards ... improve public relations and safety conditions. Decide *today* to have a Heath Leakage Control Survey on your property!

You Can't Sell Gas that Leaked Out!

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Write, Wire, or Phone for Complete Information

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Buckeye

MEDIUM UTILITY DITCHER

...for Greatest Dollar Value!

Buckeye's brand new model 303 is the outstanding wheel-type ditcher for its size and capacity developed in 60 years of Buckeye experience! . . . Low in first cost and easy to maintain it has been "contractor proven" in a wide variety of soils and climates . . . Digs to 5 ft. depths in 10, 12, 14, 16, 18 and 20 in. cutting widths at digging speeds up to 18 f.p.m. . . . Cuts the right size ditch for most applications in city, county and utility work and is ruggedly built to withstand the many abuses usually encountered . . . Small and compact with low ground bearing pressure . . . Positive depth control in hilly and rough terrain . . . Your dealer has complete details and —

Only Buckeye has a Ditcher for every Ditching Job!

GAR WOOD GW INDUSTRIES

ASSOCIATIONS

North Carolina State to offer gas short courses

Four five-week courses in gas technology will be offered during 1954 by the Department of Chemical Engineering of North Carolina State College, Raleigh, beginning March 15.

The short course is designed to give the student technical information concerning the various gases, their properties, behavior, problems of manufacture and transportation, and to thoroughly acquaint him with the maintenance, installation, and repair of gas appliances. In addition, the student receives training in safety practices, public relations, and information on competitive fuels.

The schedule of courses is as follows: March 15-April 10; April 19-May 15; May 24-June 19; June 28-July 24; and Aug. 2-Aug. 28.

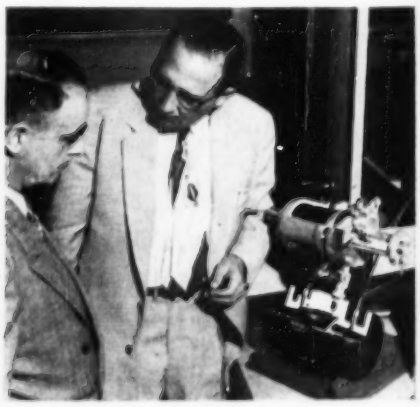
Information bulletins and applications are available from Edward W. Ruggles, director, college extension service, North Carolina State College, Raleigh.

Instrument short course attracts 400 attendants

More than 30 speakers took part in the third annual instrument short course sponsored jointly by the Southern California Meter Assn. and the Los Angeles Harbor Junior College on Nov. 19-20 in Wilmington, Calif.

Over 400 registered for the two-day meeting, including 87 who took part in practical methods sections to study the service and maintenance of specialized metering equipment. The practical methods sessions were sponsored by the Foxboro Co., the Bristol Co., Brown Instrument Division of Minneapolis-Honeywell Regulator Co., Wheelco Division of Barber Coleman Co., and Leeds and Northrup Co.

Feature of the meeting was an exhibit of



F. H. Wehrman, Grove Regulator Co. (right), discusses a cutaway model of a Grove Flex-Flo valve with Wallace C. Messinger, Mountain Fuel & Supply Co., Salt Lake City, at the instrument short course in Wilmington, Calif.

measuring equipment by 43 different manufacturers. A portion of one entire building was given over to this purpose.

Walter P. Wills, Brown Instrument Div., Minneapolis-Honeywell, discussed the future of instrumentation at the general dinner session. He also traced the history of instrumentation, and showed how the trend is toward the application of electronics to conventional instruments. His thought was that existing instruments with improvements and changes will be in use for many years to come.

F. M. Partridge, measurement engineer for the Southern California Gas Co., was in charge of arrangements for the meeting.

ASHVE convention program presents technical papers

Plans have been completed for the 60th annual meeting of the American Society of Heating & Ventilating Engineers, scheduled for Houston on Jan. 25-27. Headquarters will be the Rice hotel.

Among the 13 technical papers to be presented at four sessions are Prediction of Cooling Tower Performance, by W. W. Smith; Heat Flow Characteristics of Hot Water Floor Panels, by E. L. Sartain and W. S. Harris; Effects of Nonuniformity and Furnishings on Panel Heating Performance, by L. F. Schutrum and C. M. Humphreys; Room Air Distribution Research for Year-Round Air Conditioning, by H. E. Straub and S. F. Gilman; and Cooling a Small Residence Using a Perimeter-Loop Duct System, by D. R. Bahnfleth, C. F. Chen, and H. T. Gilkey.

Sound philosophy needed PCGA-PCEA meeting told

The utility industry needs to have a sound philosophy, an efficient internal organization, a good product and faith in the government and in those it serves if it is to meet the challenge of the future, Henry B. Sargent, president of the Arizona Public Service Co., told a luncheon meeting of utility accountants in Los Angeles recently.

The occasion was the joint fall conference of the accounting section of the Pacific Coast Gas Assn. and the administrative services section of the Pacific Coast Electrical Assn. on Nov. 12-13.

Mr. Sargent pointed out that the utility must conduct its business in a manner that will be best for the nation and for the customer it serves. He emphasized that it is the duty of the utility to support a sound money policy, and to make an organized effort to work for sound regulation of the entire industry.

He traced the part of federal regulation in the utility industry and pointed toward a new trend to return this power to the states.

"This new trend," he said, "is to take power from the federal government and return to the states those things which should never have been put in Washington."

Over 150 western utility accountants attended the two-day conference.

Co-chairmen of the meeting were John Brass Jr., representing the PCGA, and George Coughlin Jr., representing the PCEA. Both are with the Pacific Gas & Electric Co. of San Francisco. J. T. McNab, Arizona Public Service Co., was vice chairman.

Carl Weiss, Southern California Gas Co., headed the section meeting on clerical manpower standards; and J. R. Lemant, Southern Counties Gas Co., led the discussion on customers accounting activities. A section meeting on mechanized accounting potential was headed by John L. Liecty, Arizona Public Service Co., Phoenix. He was assisted by W. W. Hall, methods and procedures expert for Ebasco Services, New York. R. E. Davis, Southern California Edison Co., headed a section on right-of-way and land.

Southeastern Gas Assn. new name for Mid-South group

As a result of action taken during the 15th annual meeting held recently in Raleigh, N. C., the Mid-Southeastern Gas Assn. by constitutional amendment changed its name to the Southeastern Gas Assn.

Reported to be one of the best technical

Insist on...

PROTECTO WRAP

Cold Coating

FOR COATING AND WRAPPING UNDERGROUND OIL AND GAS PIPELINES-

Protecto Wrap Cold Coating provides hot applied enamel quality of material and workmanship on oil and gas pipelines. It is particularly recommended for reconditioning, and for field joints and repairs to coating.

Protecto Wrap Cold Coating is applied in two steps with the following described materials — either asphalt or cold tar base depending upon adjacent coatings.

1. Protecto Wrap Cold Coating Primer consists of a heavy bodied bituminous coating that is applied by conventional brushing. Care should be taken to thoroughly fill all pits on reconditioned pipe with primer.
2. Protecto Wrap Cold Coating consists of a woven glass textile cloth saturated with asphalt or coal tar pipeline enamel. This coating is applied by spiral wrapping over the primer while it is still wet.

Our sales representatives are available to demonstrate this material and method. Address orders or inquiries to our nearest sales office or to P. O. Box 82, Englewood, Colorado.

PROTECTO WRAP COMPANY
ENGLEWOOD, COLORADO

sessions ever held, the meeting featured talks on developments in industrial gas, covering textiles, bottle washing, ceramics, and boilers; a panel on working on consumers' premises; and discussions on control of sales and installation of approved equipment and appliances; sales department responsibility after natural gas; and accounting.

The 200 in attendance elected the following officers for the coming year: John O. Sholar, South Carolina Gas & Electric Co., president; Edgar M. Hawkins Jr., Danville (Va.) Gas Dept., 1st vice president; J. D. Pickard, Piedmont Natural Gas Co., 2nd vice president; Edward W. Ruggles, North Carolina State College, secretary-treasurer.

NACE's western region holds Los Angeles meeting

Two technical practices committee meetings and nine technical papers made up the third annual Western Regional divisional technical conference of the National Assn. of Corrosion Engineers in Los Angeles on Nov. 19-20.

The meeting was preceded by a three-day short course in cathodic protection held by the department of engineering and university extension, University of California at Los Angeles in cooperation with the NACE western division.

Gas engineers attending the two-day conference took particular interest in a talk on "Plastic Tape as Corrosion Control," by Howard D. Segool, Polyken Products Dept., the Kendall Co. He discussed the application of a polyethylene-type tape as a corrosion control pipe coating. In particular he emphasized the low moisture take-up, high insulation resistance, low dielectric constant and high electrolytic corrosion resistance properties of the material.

Chairman and co-chairman of the technical session on cathodic protection were P. W. Hill (left), Signal Oil & Gas Co., and N. K. Senatoroff, Southern Counties Gas Co.

Fred Hough, vice president of Southern Counties Gas Co., talked on the public safety aspects of corrosion protection. Referring to long distance, high pressure pipelines, he pointed out that the gas industry's plant extends throughout the country; through cities and towns and across farming land; and for this reason it must be maintained and operated with due regard for public safety.

Mr. Hough emphasized the gas industry's need for a code for pressure piping and described the work of subcommittee eight, of which he is chairman, toward the development of such a code.

Over 100 persons were enrolled in the three-day short course which preceded the conference. Opening with a session on basic electrochemistry, the course touched on the general subject of corrosion engineering, field testing practices and measurement techniques, and the economics of cathodic protection.

E. P. Doremus, Cathodic Protection Service, Houston, described the design and application of the various types of cathodic protection techniques, indicating the specific use to which each type of service is most applicable. R. M. Wainwright, associate professor of electrical engineering, University of Illinois, presented a graphical study of the economics of cathodic protection. He advanced a program for analyzing all the costs involved in a protection project.

AGA committees headed by Harper and Ramsey

Two new chairmen of AGA committees were named recently: B. H. Harper to head the corporate secretaries committe for 1954

New reasons why.. Sherman Power Diggers give you More for '54

NEW "STRESS-DESIGNED DIPSTICK, BOX-TYPE CONSTRUCTION
NEW REINFORCED BOOM, EXTRA BEARING SURFACE FOR LONGER PIN AND BEARING LIFE
NEW DOUBLE-BRAID HOSES FOR MAXIMUM DEPENDABILITY
NEW SWING CONTROL SYSTEM GIVES BETTER CONTROL, SMOOTHER ACTION
NEW REGULATOR VALVES FOR SMOOTH, POSITIVE CONTROL OF LIFT AND CROWD CYLINDERS

Important new features, combined with advantages proven by thousands of users, add up to more production for your digging dollar! The Sherman Hydraulic Power Digger is designed and built for that wide range of job requirements beyond the economical use of hand labor and below the efficient use of larger equipment. Yes, between the smallest and largest jobs, you'll find there's always a place for your Sherman Power Digger! Ask your nearby Sherman dealer for an on-the-job demonstration today. Write for free literature, Dept. JIc

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PRODUCTS, INC.
ROYAL OAK, MICHIGAN

Designed, Engineered and Manufactured jointly by SHERMAN PRODUCTS, Inc., Royal Oak, Mich. WAIN-ROY CORPORATION, Hubbardston, Mass.
Patent No. 2,303,825. Other patents pending.

E. L. Ramsey

B. H. Harper

and Elmer L. Ramsey to chairman the personnel committee.

Mr. Harper, secretary of Northern Natural Gas Co., Omaha, suggested the organization of corporate secretaries in 1950. In addition to him, 14 executives from gas utility and transmission companies form the committee.

Mr. Ramsey is assistant vice president of employee relations and director of industrial relations for Laclede Gas Co., St. Louis.

Man-of-the-Year named by Southeastern group

Honored this year by the Southeastern Gas Assn. for his outstanding contributions to the gas industry was J. M. Mason, distribution superintendent of the Roanoke (Va.) Gas Co., who was named gasman of the year by the association. (See convention story in this issue.)

Mr. Mason began his career as foreman in charge of laying services, becoming foreman of outside construction in 1929, and advancing during the years until in 1941 he was made distribution foreman. In 1944 he assumed his present position.

The citation read in part ". . . much of the splendid employee cooperation and good public relations enjoyed by the company . . . is attributed in large measure to his high standard of conduct and dependability. . . "

Association notes

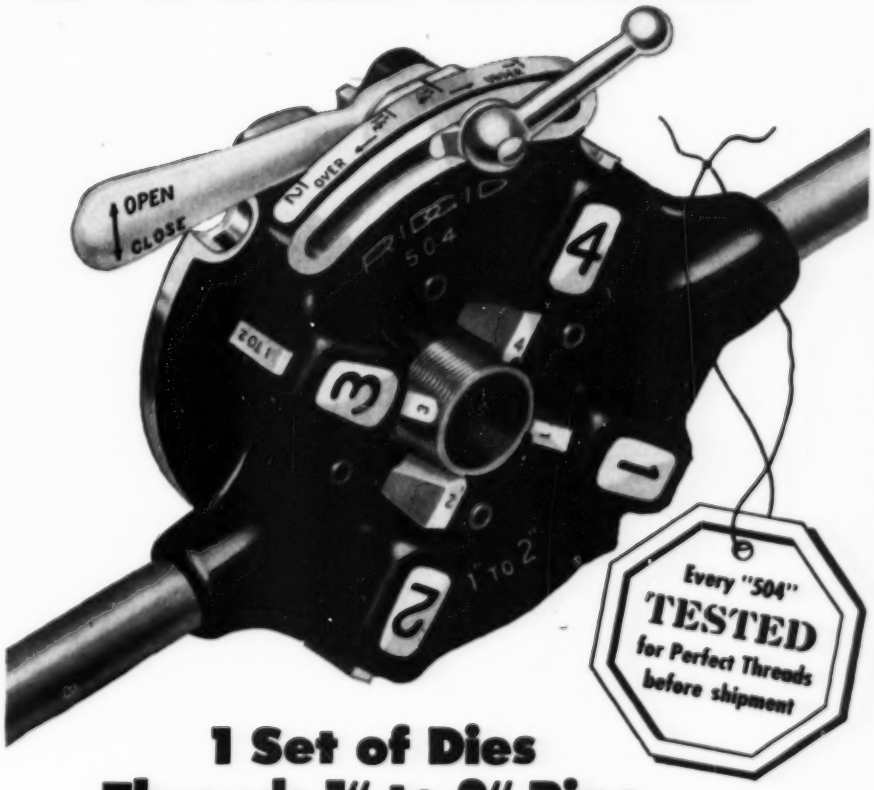
The mid-winter conference of the public utility buyers' group of the National Assn. of Purchasing Agents will be held Feb. 15-16 at the Lord Baltimore hotel, Baltimore, Md. Discussions will include forecasts of the economic situation; buyer and manufacturer panels on pricing, escalation, and progressive payments; and symposium on steel, copper, and aluminum.

Organization of new NACE sections at Montreal and Edmonton, Canada, and Miami, Fla., is now under way by interim officers. The new sections will bring the number organized in NACE to 38.

The Direct Mail Advertising Assn. has awarded the AGA a 1953 "Best of Industry Award of Merit" for its dealer sales program, "Pattern for Profit."

For Easiest Pipe Threading ... it's a "504"

RIDGID



1 Set of Dies Threads 1" to 2" Pipe

- Instant change to 1", 1¼", 1½" or 2" pipe regardless of position of quick-opening lever.
- Wide open easy-to-read size bar . . . adjustable to over and undersize threads.
- Quick-opening lever retracts dies instantly without stopping power drive—no slow backing off.
- 4-jaw workholder centers pipe for accurate threading—no lead screw to jam.

For unmatched easy, fast, clean threading with your power drive, buy precision-made RIDGID 504 at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

Abstracts

VISCOSITIES OF NATURAL GAS COMPONENTS AND MIXTURES — Prepared by N. L. Carr, this is IGT Research Bulletin No. 23, presenting a literature survey, the laboratory equipment design, experimental techniques, the experimental data, and correlations, for the determination of the absolute viscosity of methane and three natural gas mixtures at pressures up to 10,000 psi and temperatures from 70° to 250° F.

Because of the high pressures involved, the viscometer was enclosed in a special bomb in which the temperature and pressure were accurately controlled and measured. Two pyrex viscometers of the Rankine type were constructed and used in this investigation. Each viscometer consisted of a relatively long, small-bore, capillary tube modified for high-pressure use. Gases were admitted to the viscometer and forced through the capillary tube under laminar flow conditions.

Viscosity-pressure isotherms were prepared for methane and three natural gas mixtures. The diagrams show the effect of temperature, pressure and composition on the viscosity of these gases. These data were correlated in a simple manner in the form of reduced charts, so that the viscosity of gas mixtures and non-polar gases can be estimated at any temperature and pressure within the limitations of the correlations.

An alternate method for estimating high-pressure viscosities of gases and gas mixtures was developed, and compared with experimental values and found to be remarkably accurate. This method utilized the analogy between the viscosity and kinetic pressure, the latter calculated from an accurate equation of state.

The viscosity data obtained were compared with accurate published data within the ranges covered by the latter, and found to be in excellent agreement. On the reliability of the data it is concluded that the maximum error is within 1% in most cases, and within 2% for the remaining. Internal consistency and reproducibility of the data were very satisfactory, with use of the two viscometers and repeated measurements.

INVESTIGATION OF THE PRESSURE LOSSES OF TAKEOFFS FOR EXTENDED-PLENUM TYPE AIR CONDITIONING DUCT SYSTEMS—This is the report of an investigation conducted by the engineering experiment station of the University of Illinois in cooperation with the AGA and National Warm Air Heating and Air Conditioning Assn.

This bulletin is a combined report of two separate though closely related research projects which had to do with takeoffs for air duct systems of the extended-plenum type and which were conducted in the mechanical engineering laboratory.

During the first part of the investigation, the objective was to determine shapes of takeoff fittings which not only would give good performance but also would be simple enough in construction to be accepted by the industry as standards.

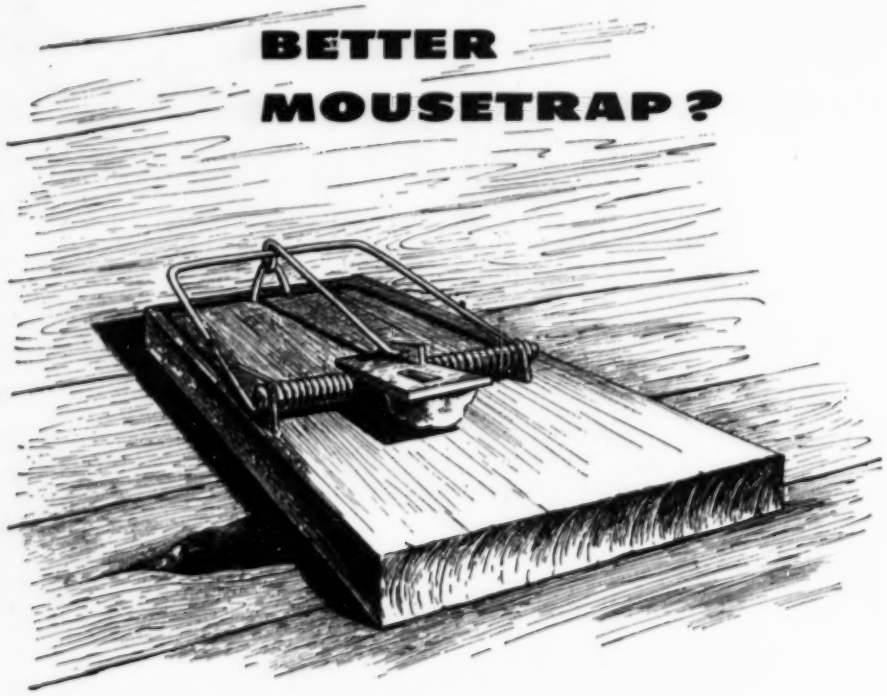
For this purpose, a 7-in. diameter branch duct was connected to a 12-in. x 8-in. extended plenum by one of many experimental takeoffs. Twenty designs of side takeoffs and nine designs of top takeoffs were studied over a range of air-flow rates and their pressure losses determined. As a result of this part of the investigation, certain sizes and shapes of takeoffs were selected as desirable standards.

During the second part of the investigation, the objectives were (1) to determine the performance of several sizes of standard side and top takeoffs when installed on larger extended-plenums than previously used, and (2) to study the effect of the relative locations of two or more takeoffs on the pressure losses of individual takeoffs.

For this purpose, 24-in. x 8-in. and 24-in. x 12-in. extended plenums and 7-in., 8-in., and 9-in. diameter branch ducts, together with corresponding standard side and top takeoffs, were utilized.

The pressure losses of all takeoffs were found to be a function only of the ratio of the velocity in the branch duct to the velocity in the plenum just upstream of the takeoff.

The results also showed that the pressure losses of standard takeoffs (recommended commercial types) did not depend upon the size and shape of the extended plenum.



The story of the reward for a better mousetrap is proverbial. But the fact remains that most mice are still caught by this simple, economical and effective contraption.

Gas purification is a parallel case.

Iron Sponge, preferred for the removal of H_2S seventy-five years ago, is still preferred today. And for these same reasons . . . simplicity, economy and effectiveness.

Iron Sponge operates with high efficiency at high or low pressures, has excellent capacity and activity, gives long service between foulings and is simply and quickly regenerated.

CONNELLY, Inc.

People

Promotions

E. D. Sherwin

L. M. Klauber

San Diego Gas

After 43 years of active service L. M. KLAUBER, San Diego Gas & Electric Co., has resigned as chairman of the board and chief executive. He will remain as a member of the board and of the executive committee which will include E. D. SHERWIN as chief

H. G. Dillin

R. J. Phillips

San Diego Gas

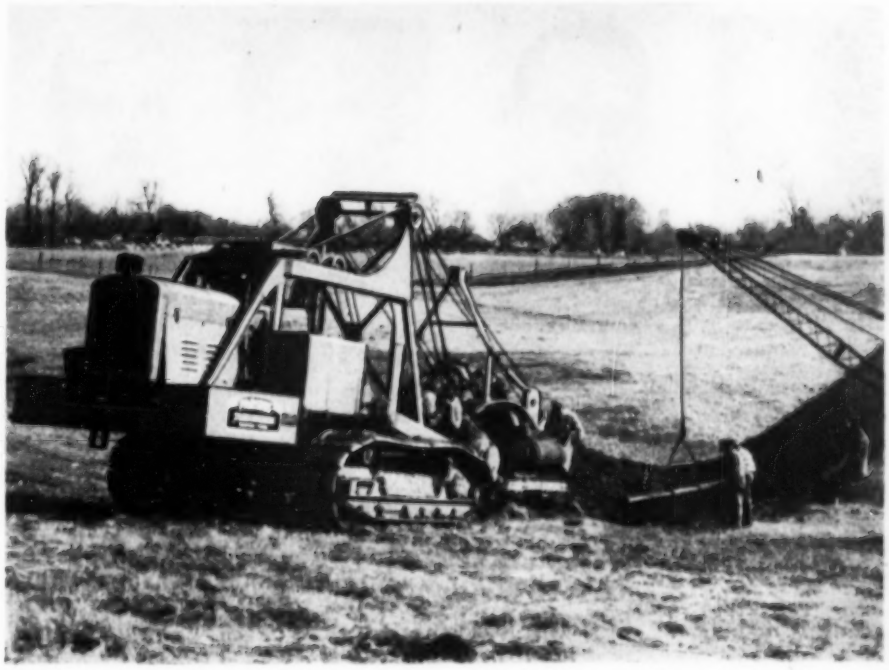
executive officer and H. G. DILLIN in the newly created post of executive vice president. As a director, Mr. Dillin replaces HANCE H. CLELAND, who is also retiring. RALPH J. PHILLIPS succeeds Mr. Dillin as vice president in charge of sales.

American Meter Co. has appointed FRANK H. ALLEN and WILLIAM SUMRALL JR. to its sales organization. Both men have been with the company since 1952.

CHARLES W. PUNTON has been appointed director of engineering of the Mine Safety Appliances Co., Pittsburgh. He has been with the company since 1929.

JAMES H. MARKS has been appointed operating manager of Equitable Gas Co., Pittsburgh, and ARMAND F. HOEHLE succeeds him as general superintendent of distribution.

HAROLD W. SWEATT, president of Minneapolis-Honeywell Regulator Co., was recently made chairman of the board, succeeding MARK C. HONEYWELL, who was named honorary chairman. PAUL B. WISHART, vice president and general manager, succeeds Mr.



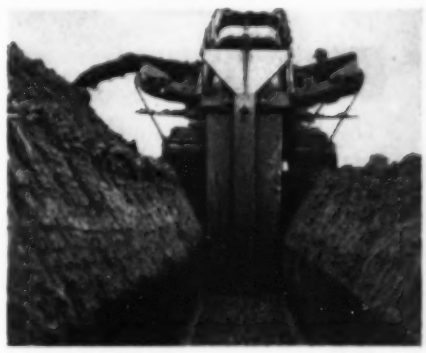
Opens trenches at rate of 17½ feet per minute...

Parsons 202 wheel-type Trenchliner sets a fast pipeline pace on transmission lines between cities, and on distribution and service lines in town. Check its wide range of digging feeds, widths and depths:

30 digging feeds, up to 17½ feet per minute, assure maximum trench production at every depth, width, and in all soil conditions. There are 15 cutting widths from 13 to 31 inches. Maximum digging depth is 6 feet. Heavy-duty digging wheel is equipped with either square or round-bottom buckets. Quick-change bucket fronts have cutting lips, or "Tap-In" teeth to suit wet or dry digging conditions. Hinged crumber sweeps trench bottom clean, ready for pipe.

Specified grades are easy to maintain because digging wheel responds instantly to sensitive friction-clutch control. Dual-purpose clutch drives the digging wheel, and acts as automatic safety throw-out to protect against shock loads. Shiftable, reversible belt conveyor discharges spoil to either side of machine.

For complete details on this heavy-duty 202 Trenchliner, contact your Parsons distributor, or write to us.



Here is another Parsons wheel-type Trenchliner . . . Model 215 for cross-country work. Digs up to 18 feet per minute. It has standard tractor crawlers with 18-inch treads, lug-type shoes.

mail to: PARSONS CO., Newton, Iowa For literature on wheel-type Trenchliners: ☐ 202 ☐ 215

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COMPANY ..... DIV. .....

STREET .....

CITY ..... STATE .....

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Tom McDonald

Minneapolis-Honeywell

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Minneapolis-Honeywell

Sweatt as president. Other changes include addition or two members to the board—vice presidents TOM MCDONALD and A. M. WILSON—and retirement of four officers. They are W. L. HUFF, director, executive vice president and former treasurer; R. P. BROWN, vice president and chairman of the board of the company's Industrial Division in Philadelphia; GEORGE A. DUTOIT, vice president in charge of manufacturing; and L. MORTON MORLEY, vice president and formerly in charge of sales for the Industrial Division. Mr. Honeywell, Mr. Huff and Mr. Brown will continue as directors.

Earl Genn

F. D. Logan

Dollinger

EARL GENN and FREDERICK D. LOGAN have been appointed district sales representatives in the Chicago area for the Dollinger Corp., Rochester, N. Y.

MURRAY F. GILL has resigned as president of the Kansas Gas & Electric Co., Wichita. He will continue as board chairman and chief executive officer. He will be succeeded by GORDON W. EVANS, who has been vice president and general manager since 1949.

C. J. KRIBS, who joined American Meter Co. in 1947, has been made assistant to the manager of the southern division of Westcott & Greis Inc., American Meter subsidiary. LEE HOLT has joined the company as a sales engineer for Arkansas, Louisiana and east Texas.

After 33 years with Oklahoma Natural Gas Co., Tulsa, N. A. NEWTON has retired. He has been Tulsa district sales manager since 1931.

The Allis-Chalmers Manufacturing Co., Milwaukee, has announced the promotion of NEIL POHL to the newly created position of motor grader sales manager, industrial sales department of the tractor division.

MILTON W. ELERT has been appointed advertising and sales promotion manager, succeeding E. C. BARROWS, who will assist him, and JOHN M. STORM succeeds Mr. Elert as sales manager of the Detroit-Michigan Stove Co.

W. M. MILBOURNE has been appointed Duo-Therm utility sales representative for the Duo-Therm Div. of Motor Wheel Corp., Lansing, Mich.

ERICK LARSON, officer and director of Gas Construction & Service Co. Inc., New York, has resigned.

Southern Counties Gas Co., Los Angeles, has established a new management depart-

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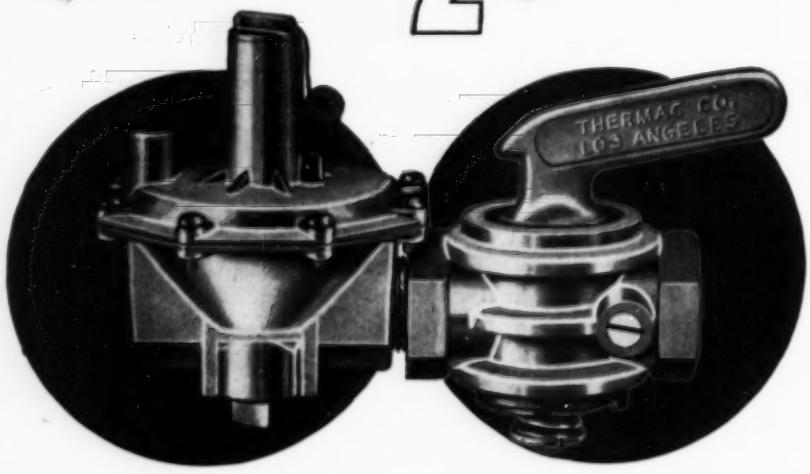


APPLIANCE REGULATOR

Here's the famous Thermac "T" Series Regulator used on millions of gas appliances. Use it now in conjunction with the THERMAC Main Gas Shut-Off Valve.

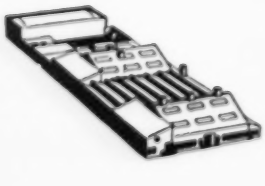
1. Lower cost per BTU capacity
2. Greater BTU capacity per size
3. Small octangle body easy to install
4. Greater diaphragm sealing area prevents leaks

GAS SHUT-OFF VALVE

Costs considerably less yet it is 2 to 3 times stronger and greater in capacity than ordinary gas control valves. This new Thermac valve, made of special high tensile aluminum alloy long proved in aircraft practice won't gall or stick. Valve rotor is treated with a hard facing and special long life lubricant. Pilot gas take-off may be provided on either side.

Appliance manufacturers are invited to request samples and quantity prices.

Use Thermac Regulators and Shut-Off Valves together for greater economy.



THERMAC HM COMPANY

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ment designated the construction and distribution department. The engineering department will be discontinued. In the reassignment of responsibilities vice president F. A. HOUGH will become expert technical consultant for the company, JAY DAVIS JR. has been appointed manager of the new department, and MONTE M. TEMPLE will be administrative head of the department as superintendent of operation.

The Arkansas-Western Gas Co., Fort Smith, Okla., has announced the appointment of JOSEPH GANNER as district manager at Clarksville, Ark.

LESLIE A. SIMPSON, general gas engineer for Consumers Power Co., New York, retired last month after 40 years in gas operations. He is succeeded by H. RAY WORTMAN, a gas engineer who joined the company in 1947.

O. W. BARNETT has been promoted to the post of manager of gas and Nordstrom valve products for Rockwell Manufacturing Co., Pittsburgh, succeeding GILBERT BOWMAN, named manager of products department of the meter and valve division, a newly created post. GEORGE A. CUNNINGHAM, formerly assistant gas products manager, assumes managership. J. N. HOLLAND has been appointed sales engineer for the meter and valve division, covering most of east Texas, relieving KENNETH REMBERT, who will concentrate on the Port Arthur-Beaumont-Lake Charles area.

WILBERT L. MILLER has been appointed sales promotion manager for the Gas Division of the New England Electric System, with headquarters in Malden, Mass.

Servel Inc., Evansville, Ind., has reassigned duties of production and engineering personnel to consolidate civilian and defense production more effectively. New duties are as follows: HERMAN KRAEMER, special assignment under vice president Theodore W. Rundell; E. G. SCHIFF, civilian production manager; JOHN DAVIDSON, defense production operations manager for both F-84 wings and cartridge cases. Civilian production posts reassigned include: JACK RITTER, superintendent of refrigerator unit and cabinet divisions; THOMAS SMITH, room air conditioning division superintendent; A. H. COUNTS, commercial refrigeration division superintendent. Defense production division posts under Mr. Davidson went to: ELLWOOD CONNOR, head of manufacturing for the division; and HARRY AXFORD, now superintendent of the miscellaneous aircraft parts section. ROBERT S. TAYLOR has been made director of quality control. His former duties have been assigned to DR. CARL T. ASHBY as chief engineer for refrigerators and freezers, and A. C. SHUART as chief engineer for defense engineering.

Formerly vice president in charge of manufacturing for A. O. Smith Corp. at Toledo, FRED MACKEY has been given more respon-

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Detectron "505"

PIPE DETECTOR

takes all guesswork out of Pipe Detection

◀ DETECTS, TRACES and CENTERS PIPE, CABLE, ETC.
◀ ESTIMATES EXACT DEPTH
◀ SEPARATES PARALLEL PIPE, CABLE and CONDUIT

A crystal ball might be one way to locate buried pipe or cable at an excavation site. But . . . a *better, safer* and *more efficient* way is to use the new, improved Detectron "505" that accurately pinpoints the exact length, depth and location. *Stop guessing —and be sure!*

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COMPANY_____

NAME_____ POSITION_____

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Fred Mackey
A. O. Smith Corp.

C. H. Johnson
Sherman Products

sibilities administering company manufacturing problems and will return to the Milwaukee headquarters of the company as a member of the central staff. ARNOLD J. RISTOW, manager of the Rochester plant, also returns to Milwaukee to join Mr. Mackey's staff.

Transfers

On joining Sherman Products Inc., Royal Oak, Mich., CHESLEY H. JOHNSON of Worcester, Mass., has been appointed New England and New York district sales manager.

STEPHEN C. BIXBY has been appointed operations manager of Minneapolis-Honeywell Regulator Co.'s new Appliance Controls Division plant at Gardena, Calif. He was formerly chief of mechanical design for the company's Heating Controls division in Minneapolis.

The election of HARLAN H. PIGOTT as president of the Carnegie Natural Gas Co. and Appollo Gas Co., Pittsburgh, was announced recently. Mr. Pigott has been vice president in charge of operations for Equitable Gas Co., also Pittsburgh, for more than three years.

W. T. Jebb
Hartford Gas

H. H. Pigott
Carnegie Natural

The Hartford (Conn.) Gas Co. has announced the appointment of W. T. JEBB as vice president and general manager of the company effective Jan. 4. Mr. Jebb, who comes to the company from the Connecticut Light & Water Co., Waterbury, has had more than 30 years' experience in gas utility operation.

Deaths

HARRISON WILLIAMS, 80, a director of the American Gas & Electric Co., died recently. Mr. Williams, who began his business career with a small bicycle factory, once controlled corporations with assets, including numerous utilities, valued at $2 billion.

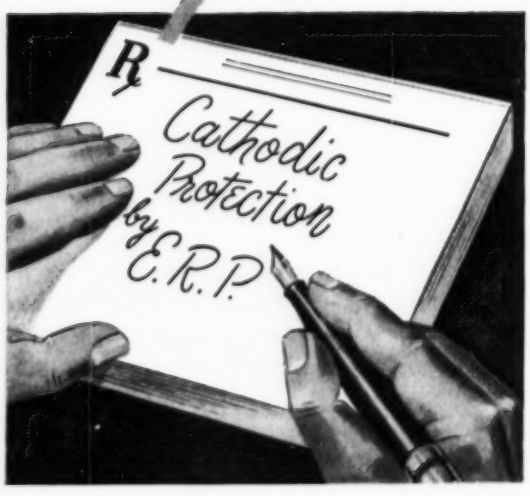
R. R. VANHORN, retired lawyer and former president of Luzerne County Gas & Electric Co., Wilkes-Barre, Pa., died recently at the age of 83. He had served more than four decades as counsel and vice president of the company, a United Gas Improvement Co. subsidiary. He was made president in 1939 and retired in 1945.

Elliott Taylor dies

Word of the sudden death of Elliott Taylor came just as *GAS* was going to press. He died of a heart attack at his Gettysburg, Pa. home. Lack of time and information do not allow us to give complete facts about his death in this issue.

Long a prominent figure in the gas industry, Elliott will be remembered for his outstanding ability as a writer and authority in his field. In recent years he has been publisher of the *Ameircan Gas Journal* with headquarters in New York.

℞ FOR CORROSION...



You don't need a specialist to *recognize* Corrosion. But you do need one to treat it successfully. The skill required to achieve complete corrosion control comes only from the knowledge and experience gained through years of practical application.

Recognition of that fact is one reason more and more people are turning to E.R.P. for assistance on corrosion problems — one reason that thousands of buried or submerged steel structures of all types have been successfully protected against corrosion by E.R.P. engineers. Corrosion specialists *for over 17 years*, these men are highly trained and well equipped to help you with *your* corrosion problem. Write for full information today.

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BELLEVILLE 9, NEW JERSEY
REPRESENTED IN PRINCIPAL CITIES IN THE UNITED STATES

COMPLETE CATHODIC PROTECTION SERVICE • DESIGN ENGINEERING MAINTENANCE INSTALLATION EQUIPMENT

E-27

NEWS

PUC approves twin-fuel furnaces for Dayton area

The Dayton (Ohio) Power & Light Co. had spelled out for it by the Public Utilities Commission of Ohio details of a formula under which the company can approve "twin-fuel" furnaces that use both gas and oil.

DP&L recently was given permission by the commission to grant heating permits for the furnaces that switch from gas to oil for fuel when temperatures drop. The formula takes into consideration the fact that even though the twin-fuel furnaces do not use gas during cold days, they do reduce the amount of gas in storage while they are in use.

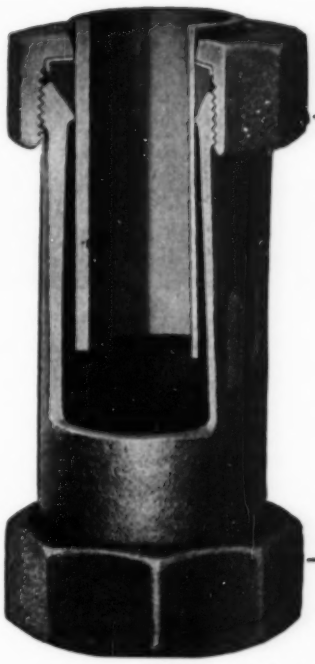
The decision ordered that for every three twin-fuel permits issued, DP&L must give up one permit it was entitled to under the part of the order balancing permits issued by the Columbia Gas System customers in and outside Ohio.

Control of Massachusetts firm bought by investors

A group of prominent Boston, New York and Midwestern investors have purchased controlling interest in the Pittsfield (Mass.) Coal Gas Co. for $630,000. Joseph T. Kelley will continue in his present capacity as vice president and general manager. Newly elected president, Kenneth D. Knoblock of Chicago, a member of the purchasing group, succeeds Robert W. McCracken, bank executive of Pittsfield. Mr. Knoblock also heads the group which took over the Wisconsin Southern Gas Co. in 1945 and in 1951 was instrumental in the formation of the New Jersey Natural Gas Co.

Other new officers of the Pittsfield company are Frank A. O'Neill, vice president and treasurer, who is also an officer of the

Handing over a check for $630,000, Kenneth D. Knoblock takes control of the Pittsfield (Mass.) Coal Gas Co. from retiring president Robert W. McCracken. Mr. Knoblock, representing a group of Boston, New York and Midwestern investors, is new president of the company.



NORMAC

Couplings, Sleeves and Fittings

for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

Compression-End Service "Tee"—First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

Compression-End Service "Ell" — Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

Compression-End Iron Body Brass Core Service Stopcocks—End the necessity of threading on the job plus the elimination of the threads themselves—combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

Normac Brass Fittings Developed in 1939 for Use with Copper Tubing—Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

Couplings • Motor Bars • Sleeves • Cocks • Ball Joint Clamps • Service Tees & Ells

Wisconsin and New Jersey companies, and John C. Donnelly, vice president, who is president of the Consolidated Gas & Service Co. and has been active in utility construction and engineering work in Massachusetts since the formation of his company in 1949.

Among directors elected are two prominent New York business men, W. Barton Cummings, a banker, and Leonard Milano, a gas consultant of Commonwealth Services Inc. William T. Wright of Harrisburg, Pa., who has been active in the oil and gas business for over 30 years, was also made a director.

Latest addition to the nationwide plant and sales office facilities of General Controls Co. is this new appliance controls manufacturing plant covering more than a city block at Alameda and Flower streets in Burbank, Calif.

ARCCO
The World Over
wherever there is gas
ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
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Available for Early Delivery
SEND FOR BULLETIN No. 101R2

General Controls' new Burbank plant dedicated

General Controls Co., Burbank, Calif. recently played host to scores of civic and business leaders, plus a large group of customers and dealers, at dedication ceremonies marking completion of the company's new appliance controls plant at Alameda and Flower streets in Burbank.

A specially built panoramic display was used to show the part that automatic controls play in American industrial and household life. It was created to explain with graphic displays and working equipment the many ways in which people have become dependent upon automatic controls to heat and cool their homes, prepare their meals, wash and dry their clothes, and even do the dishes with an automatic source of hot water.

The exhibit also explained many of the industrial applications of automatic controls which minimize repetitious effort that formerly depended upon human attention.

The new 120,000 sq ft plant was designed and built especially for the Grayson-Greenamyer Appliance Controls Div. of General Controls Co., and is located just across the Glendale-Burbank city line from the company's main plant and national headquarters in Glendale. Space has been provided in the design of the new plant for approximately 1000 employees.

Company officials on hand for the ceremonies included A. W. Ray, executive vice president; John F. Ray, vice president in charge of sales; Richard A. Ray, vice president in charge of manufacturing; I. H. Nye, treasurer; and John H. Grayson, pioneer designer and manufacturer of automatic controls, who has been in charge of research and development on appliance controls since the Grayson-Greenamyer Co. was purchased by General Controls Co. three years ago.

GAMA contest to honor effective selling points

Smokeless broiling, lifetime burners, and sturdy construction are features of automatic gas ranges judged as most effective selling points in a GAMA contest to discover ideas for demonstrating gas ranges. The contest, open to all wholesale and retail gas range salesmen, was aimed at obtaining demonstra-

tion ideas to be incorporated in the booklet, "Quickie Demos That Sell More Automatic Gas Ranges."

Prize winners were: Donald Vetterling, Greenfield (Mass.) Gas Light Co.; C. Y. Smith, Lone Star Gas Co., Vernon, Texas; Robert L. Murdock, Belmont Home Appliance Co., Indianapolis, Ind.; John T. Cardall, Burbank, Calif.; Joseph H. Millstone, Chicago, Ill.; and D. W. Kyle, The Tappan Stove Co., Mansfield, Ohio.

Gas companies launch "$25 does it" dryer campaign

Coordination of sales-making forces of all segments of the gas industry is the key strategy behind the "$25 Does It" gas clothes dryer campaign launched by the Southern California Gas Co. and Southern Counties Gas Co., according to W. Q. Kringle, SoCal's supervisor of dealer sales and promotion.

"Our principal objective is to gain maximum results from gas dryer merchandising, advertising, selling and sales promotion activity, through the coordinated efforts of gas dryer manufacturers, distributors, dealers and gas companies," Mr. Kringle announced to representatives of participating manufacturers, distributors, and gas companies at a "kick-off" luncheon held in the Rodger Young auditorium, Los Angeles, Dec. 2.

The gas companies' advertising will feature a consumer "buy now" inducement, a $25 trade-in allowance on the customer's old clotheslines. This inducement will also be featured in a dealer direct-mail program, and in dealer window and floor displays.

Thirteen gas clothes dryer brands will be represented in the campaign.

The gas companies are making complete kits available to dealers during the campaign, together with suggestions for using this material to best advantage. A "Dealer's Timetable of Action" helps both the dealer and sales representatives of participating companies to schedule sales promotion events, and to organize campaign details.

Home service representatives of the gas companies will make home calls on custom-

With a clothes dryer for his podium, W. Q. Kringle delivered the pitch at the dealer-distributor luncheon heralding the coordinated gas clothes dryer campaign.

No Longer is it Necessary to Invest in Dual Fuel to Utilize Gas.

just *Add* gas!

***with* WEBSTER'S**
REVOLUTIONARY
PACKAGED RECTILINEAR* GAS BURNER

The Packaged Rectilinear makes four inches pressure do the work of four pounds with fractional horsepower. You can fire gas — automatically — through any narrow opening without disturbing your present firing equipment — hand or stoker fired coal, oil or whatever it may be.

WRITE FOR LITERATURE

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TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

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Birmingham, Ala.
Pipe Sizes 2" thru 12"

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Chicago 1, Ill. ..... 333 N. Michigan Ave.
New York 4, N. Y. ..... 80 Broad Street
Kansas City 6, Mo. ..... 1006 Grand Ave.
Dallas 4, Texas ..... 3200 Maple Ave.

PACIFIC STATES Cast Iron Pipe Co.
Provo, Utah
Pipe Sizes 2" thru 24"

Sales Offices
Provo, Utah ..... P. O. Box 18
Denver 2, Colo. ..... 1921 Blake Street
Los Angeles 48, Cal. ..... 6399 Wilshire Blvd.
San Francisco 4, Cal. ..... 235 Montgomery St.
Portland 4, Ore. ..... 501 Portland Trust Bldg.
Salt Lake City ..... Waterworks Equip't Co.
Seattle, Wash. ..... Smith Tower Bldg.

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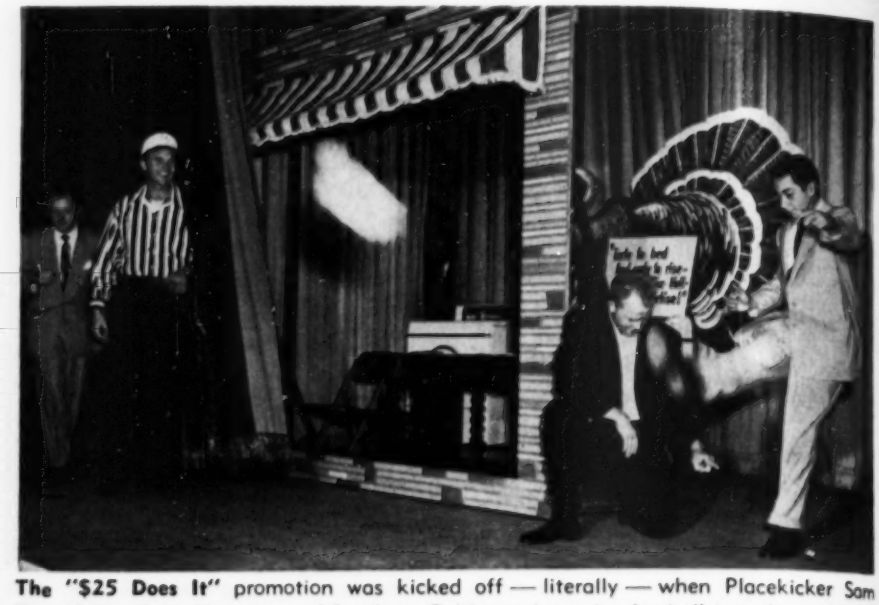
MADISON, WISCONSIN
MIDLAND, TEXAS
MOBILE, ALABAMA
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA



The "$25 Does It" promotion was kicked off — literally — when Placekicker Sam Tsagalakis of the University of Southern California booted a football into the audience. Holding is Trojan Dick Nunis.

ers who purchase and install gas dryers during the campaign, Jan. 1 to Feb. 10.

The certainty of increasing competition in the appliance field presents a challenge to all participating in the campaign, Mr. Kringle pointed out to the luncheon audience, and puts a premium on aggressive merchandising plans. The "$25 Does It" campaign is designed to help appliance dealers "out-sell" rather than to try to "out-deal" competition, he said.

Aggressive merchandising effort launched by Bryant

One of the most aggressive and comprehensive merchandising efforts in company history will be launched this month by Bryant Heater Div., Affiliated Gas Equipment Inc., when the Cleveland company sets into motion its "Profit More in '54" program. Formal announcement will be made at Bryant's annual sales meeting, Jan. 25-27, at Clearwater, Fla.

As part of the theme, a unique field training team of product and sales specialists has been established to give dealers complete schooling in the rapidly growing air conditioning field. Augmenting this 1954 promotional effort will be an expanded field sales staff.

Rate increase granted after year of hearings

The corporation commission of Oklahoma recently granted the Consolidated Gas Utilities, Oklahoma City, the same rate increase approved last January—and later rescinded—for its natural gas consumers in 44 cities. The decision means the present rates will remain in effect. The January 1952 order had been kept in effect by a federal court injunction until the case was finally decided. The increase amounted to $2,137,606 annually, or an average of 27% increase. The company had asked for $3,463,000.

The new order follows months of heated hearings in which attorneys for the opposing cities attacked figures of the utility and charged that citizens had been misled on the amount of the increase sought. This latter

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charge prompted the commission to rescind its old order and call for a re-trial of the case.

Warm weather causes drop in October gas sales

For the first time since May 1952, sales of the gas utility industry went into a decline over the previous comparable period when October 1953 sales were 4021 million therms, a drop of 1.3% from the 4073 million in October 1952.

The drop in sales was attributed mainly to the warm weather experienced in all sections of the country. There were 45% less degree days this October than a year ago. The lower househeating demand because of mild weather more than offset the rise in industrial sales.

Fort Smith Gas merges with Arkansas Oklahoma

A $7.6 million transaction consolidating the Fort Smith Gas Corp. and Arkansas Oklahoma Gas Co. was recently completed by W. R. Stephens, owner of Fort Smith Gas Corp. Although final announcement was not made, the name Fort Smith Gas Corp. will probably be retained.

Arkansas Oklahoma, which provides wholesale gas for the Fort Smith Gas Corp., serves industrial users in Fort Smith, Van Buren and Alma, while Fort Smith Gas Corp. serves the retail and commercial customers in these three towns. All classes of customers are served by Arkansas Oklahoma in a dozen communities in Arkansas and Oklahoma.

Production and sales to continue high NAM says

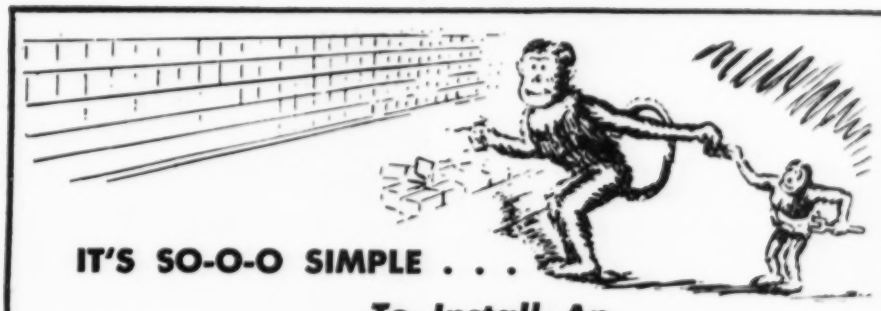
Most crystal gazers at the December meeting of the National Assn. of Manufacturers predicted no drop in production and sales for the first quarter of 1954.

George P. F. Smith, president of Norge Div. of Borg-Warner Corp., ventured the guess that the division's business would have a better first quarter than in 1953 when the industry was suffering from the hangover of scare buying following the outbreak of the Korean war.

Hirings are planned by both Norge, which expects to add around 1000 employees because of the addition of new appliance lines, and Hamilton Manufacturing Co., which added a clothes washer to its line of dryers and is increasing its work force by 10%.

Northwest companies receive merger approval

Five Washington gas companies, representing operations in 15 Pacific Northwest communities, were merged early in December into the Cascade Natural Gas Corp. (see



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The Insulator You Have Been Searching For!

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- 300# W. O. G.
- Will Not Break
- All Insulating Parts in Compression
- No Field Education Required
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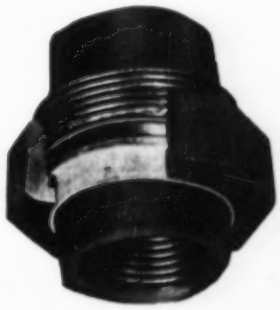
Sizes ½" - 3" Inclusive



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Manufacturers of Industrial Plastic Products

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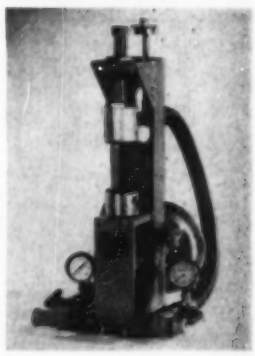
I'm the happy little character now selling friendly service for 33 gas companies. I add interest, friendliness, and effectiveness to all their advertising and sales promotion. I'll do the same for you. Complete utility service one-half cent per customer per year. $25 minimum. Satisfaction guaranteed. Write for details and free idea file. Handy Flame Service, P. O. Box 302, Indianapolis 6, Ind.

UNIVERSAL

Gas Service Regulator

REPAIR and TEST STAND

U. S. Patent No. 2,565,086



Regulator May Be Inserted Or Removed INSTANTLY!

Air-operated clamping blocks hold the gas service regulator in a vise-like grip so that it may be dismantled, repaired and tested. After repairing, all necessary settings and tests such as flow, lock-up and leakage can be quickly made. The Universal Regulator Repair and Test Stand pays for itself in time saved. For all service regulators size 2" or smaller. Write for detailed information.

UNIVERSAL

CONTROLS CORPORATION

731 WEST DAVIS STREET · DALLAS 8, TEXAS

June 1953 *GAS*, page 75), to take advantage of the expected availability of natural gas.

The five companies are Bellingham Gas Co., Bremerton Gas Co., Wenatchee Gas (serving communities bearing the same name in Washington); Northwest Cities Gas Co., Yakima, Walla Walla, and Clarkston, Wash.; Eugene and Pendleton, Ore., and Lewiston, Idaho; and Consolidated Gas Co., Yakima Valley area of Washington. The Cascade company is headed by Stewart Matthews as president.

Among the principal stockholders of Cascade is Pacific Petroleums Ltd. of Canada, an associate of Westcoast Transmission Co., which is seeking the exclusive right to provide the Pacific Northwest with natural gas from Canada. Cascade officials claim that while Canadian natural gas interests are heavily identified with the company, Cascade nevertheless is in a position to profit from the merged operations no matter whether Westcoast or Pacific Northwest Pipeline Corp., seeking to deliver gas from the Four Corners area of the Southwest, obtains the major franchise.

When a carload of year-round Servel air conditioners, the first complete carload shipped anywhere in the world to a single project, arrived in Little Rock, the mayor, members of Servel Inc., the Fausett & Co. construction firm, Arkansas Louisiana Gas Co., and the railway company turned out to meet it. The air conditioning units are for homes in Broadmoor, a 700-unit residential subdivision being built by Fausett & Co. in cooperation with Servel and Arkansas Louisiana.

Employees told of hidden wages treasure at Dayton

The mythical pot of gold at the end of the rainbow is used by Dayton Power & Light Co. to symbolize the benefits described in a booklet, "Facts About Your Hidden Wages At DP&L," recently distributed to their employees. Two-color cartoons graphically tell the story of hidden wages, such as paid vacations and company sponsored activities, which average more than $887 per employee each year. The theme of the pamphlet—that company benefits are designed to be a real help to employees and their families—is expressed in the foreword.

News Notes

Servel Inc., Evansville, Ind., has announced its new line of 1954 air conditioning equipment will be introduced to distributors and dealers at a series of six regional sales conferences in January. They will be held Jan. 4, Los Angeles; Jan. 6, Houston; Jan. 8, Dallas; Jan. 11, Atlanta; Jan. 13, New York; and Jan. 15, Chicago.

Reflin Co., Los Angeles, has granted a license to the Societe Des Fonderies de Pont-a-Mousson, Nancy, France, to manufacture glass-fibre reinforced plastic pipe. Reflin will supply engineering and technical information to enable Pont-a-Mousson, one of the largest and oldest pipe-making firms in Europe, to

Correction

In the December issue of GAS in the article entitled "Calculation of Heat Requirements to Prevent External Freezing of Piping," by T. H. Kerr and E. E. Smith, a typographical error appeared in equation 2 on page 39. The equation should read:

$$(H - H_0)_T = pv - p_0v_0 - \int_v^{v_0} pdv + T\int_v^{v_0} \left(\frac{\theta p}{\theta T}\right)_v dv \qquad (2)$$

In the original equation, the last factor dv appeared to be divided by v. Actually, the small v denotes the partial differential is a constant in respect to v.

LP Gas Installations
and
Anhydrous Ammonia Plants
More than 80 Peacock Plants prove . . .
"There's No Substitute For Experience"
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Dependable L-P Gas supply
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produce the pipe in France, Belgium, Cuba, Germany, the Saar and Spain.

A. O. Smith Corp. has purchased the Glascote Products Inc. of Cleveland. The company, which manufactures glass coated equipment for the chemical and chemical processing industries, will be operated as a subsidiary of A. O. Smith under its present name. L. T. Hickey of the A. O. Smith management staff has been named vice president and general manager of Glascote.

The largest continuous reheating furnace for seamless pipe will be built by Selas Corp. of America, Philadelphia. It was awarded the contract by the Phoenix Iron & Steel Co., a subsidiary of Barium Steel Corp. The furnace will be capable of reheating up to 18-in. diameter seamless tube requiring heats from 1200° to 1800° to permit producing of an accurately dimensioned tube in the sizing mill.

Appointment of an advisory committee on the state's fast expanding oil and gas industry has been made by Indiana's Governor Craig. State Conservation Director Doxie Moore said the new committee will assist his department's oil and gas division in keeping abreast of the needs of the industry.

Articles of incorporation were filed recently for the Northern Illinois Gas Co. as a subsidiary of Commonwealth Edison Co., Chicago. The action implements Edison's previously announced plan to segregate its gas operations (see December *GAS*, page 88).

Operating revenues for natural gas companies for the month of September totaled $156,075,179, an increase of 18.2% over the same month last year. For the 12 months ended Sept. 30, revenues aggregated $2,249,079,388, or 21.4% higher than the previous 12-month period. Gas sales to ultimate consumers for the month were 197,177 MMcf, an increase of 9.7% over 1952. Sales to residential, commercial and industrial consumers increased 8.1%, 4.6%, and 9.8%, respectively, while revenues from the three classes of service increased 16.2%, 13.4%, and 18.8%, respectively.

Westinghouse Air Brake Co. has purchased the earthmoving equipment factories of the R. G. LeTourneau Inc. at Peoria, Ill., and Toccoa, Ga. The business has been organized into a wholly owned subsidiary, known as LeTourneau-Westinghouse Co., with main offices at 2301 N. Adams St., Peoria, Ill. The new company will manufacture earthmoving equipment at both Peoria and Toccoa.

The Match Industry Information Bureau has announced its second annual award program for distinguished use of match books for advertising. Entry forms in the shape of a gigantic match book are available for those businesses eligible to win the "Joshua"

Positive Protection!

from *Runaway Pressures! Fires!*

NORWALK POSITIVE PRESSURE CUT OFF VALVES

- Gives automatic shut off when excessive pressure arises or fire occurs!
- Easily reset to desired cut off pressure!
- No pressure loss!
- All parts external to gas flow!
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- Sizes from 2" to 16"

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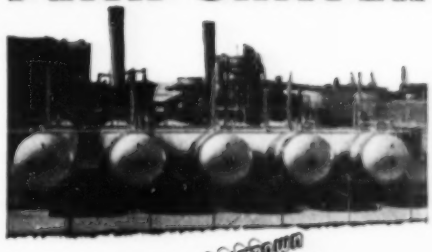

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Draketown can design and build one for you, *within your budget,* to take over all or part of your load at the turn of a valve.

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Not affected by temperature or moisture.
A perfect patching material for all BLACKTOP or CONCRETE surfaces.
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Chicago—EStebrook 9-2872

CALENDAR

January

14..SGA Air Conditioning Service Installation, East — Tutwiler Hotel, Birmingham, Ala.

14..NEGA Operating Division — Hotel Statler, Boston.

14-21..National Housewares & Home Appliance Exhibits — Navy Pier, Chicago.

15..SGA Air Conditioning Sales, East Conference — Tutwiler Hotel, Birmingham, Ala.

17-21..National Assn. of Home Builders 10th Annual Convention & Exposition—Chicago.

18-20..AGA Home Service Workshop—Deshler-Hilton Hotel, Columbus, Ohio.

21..SGA Air Conditioning Service & Installation, West — Rice Hotel, Houston.

22..SGA Air Conditioning Sales, West Conference — Rice Hotel, Houston.

25-27..ASHVE 60th Annual Meeting — Rice Hotel, Houston.

February

4..Instrument Society of America, 9th Annual Regional Conference — Hotel Statler, New York.

5..SGA Employee Relations Conference — Hilton Hotel, El Paso.

5..SGA Accident Prevention Conference — Hilton Hotel, El Paso.

8-12..Western Winter Radio-Television & Appliance Market — Western Merchandise Mart, San Francisco.

15-16..National Assn. of Purchasing Agents, Public Utility Buyers' Group Mid-Winter Conference—Lord Baltimore Hotel, Baltimore.

16..NEGA Accounting Division — Hotel Statler, Boston.

March

1-5..American Society for Testing Materials Spring Meeting — Shoreham Hotel, Washington, D. C.

4-5..AGA Transmission and Storage Conference — Jung Hotel, New Orleans.

15-17..Mid-West Gas Assn. Annual Meeting — Fort Des Moines Hotel, Des Moines, Iowa.

25-26..New England Gas Assn. Annual Meeting — Hotel Statler, Boston.

25-26..Oklahoma Utilities Assn. Annual Meeting — Biltmore Hotel, Oklahoma City.

April

12-14..AGA Sales Conference on Industrial & Commercial Gas — Edgewater Beach Hotel, Chicago.

12-14..National Conference of Electric & Gas Utility Accountants—Hotel Statler, Boston.

13-15..Southwestern Gas Measurement Short Course — University of Oklahoma, Norman.

20-23..AGA Distribution, Motor Vehicles, and Corrosion Conference—Mount Royal Hotel, Montreal, Canada.

22-23..Indiana Gas Assn. Annual Meeting — French Lick Springs Hotel, French Lick, Ind.

26-28..AGA National Conference of Purchasing & Stores — Henry Grady Hotel, Atlanta, Ga.

26-28..Mid-West Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.

26-28..Southern Gas Assn. Annual Convention—Houston.

May

10..AGA Commercial Gas School — Chicago.

10..35th Annual National Restaurant Convention & Exposition — Navy Pier, Chicago.

9-12..LPGA Convention — Conrad Hilton Hotel, Chicago.

13-14..Public Utilities Advertising Assn. — Hotel Statler, Boston.

17-21..National Fire Protection Assn.—Statler Hotel, Washington, D. C.

19-21..GAMA Annual Meeting — The Drake Hotel, Chicago.

24-26..AGA Production and Chemical Conference — William Penn Hotel, Pittsburgh.

27-28..Natural Gas & Petroleum Assn. of Canada — Prince Edward Hotel, Windsor, Ontario, Canada.

June

20-24..Canadian Gas Assn.—Banff Springs Hotel, Banff, Alberta.

28-29..Michigan Gas Assn.—Grand Hotel, Mackinac Island, Mich.

plaques (named for Joshua Pusey, inventor of the match book). Six major match companies are sponsoring the competition. Entries are due at headquarters, 1 East 43rd St., New York, by Feb. 15.

Houston Natural Gas Corp. has announced plans to expand its Lockwood Service Center at Lockwood and Harvey Wilson drives. The company has purchased the 4.13-acre tract adjacent to the 10-acre service center site and plans expansion work in the near future.

Binghamton (N. Y.) Gas Works has announced it is cutting off service to unauthorized gas heating installations to clear up a "dangerous overload" on its system. Company spokesmen indicated there were more than 100 heating units connected to the company lines by customers who had not obtained heating permits.

Gar Wood Industries Inc., Wayne, Mich., has announced the formation of the Mattoon Division at Mattoon, Ill., for production of Gar Wood bulldozers and road machinery sold through Allis-Chalmers industrial tractor dealers. Hunter Dietz, formerly plant manager at Mattoon, has been appointed division manager.

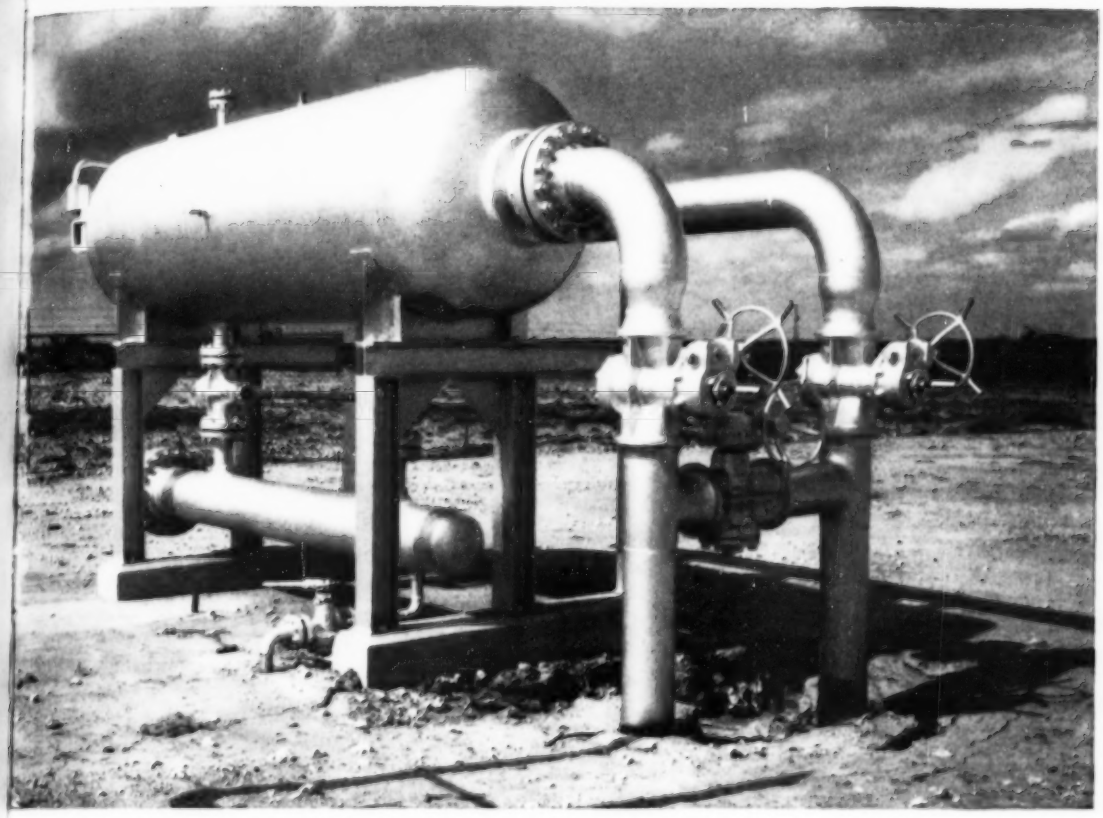
National Radiator Co., Johnstown, Pa., has purchased the principal assets of the Viking Air Conditioning Corp., Cleveland. It will be operated as the Viking Air Conditioning Division of National Radiator, with the former Viking president being named vice president of the parent company and general manager of the new division. The company will continue to produce blowers for warm air furnaces, humidifiers, attic and window fans and window type summer air conditioning units.

Two new distributors for Servel household appliances have been appointed. Allen Distributing Co., Providence, R. I., will have as its territory all of Rhode Island, two counties in eastern Connecticut, and five counties in southern Massachusetts, while the Kimball Distributing Co., Salt Lake City, will serve nearly all of Utah, parts of Idaho, Nevada, Oregon and Wyoming.

Next on the list for changeover from manufactured to natural gas in the Consolidated Edison Co. service area is the First Ward of Queens, including Long Island City, Astoria, Steinway, and Ravenswood. The work is expected to begin about the middle of February.

The Chambers Corp., Indianapolis, has announced a new gas range french fry accessory which permits deep frying of such foods as french-fried potatoes, shrimp and doughnuts to be prepared inside the range. It is an aluminum deep fat fry basket, which converts the Thermowell of the range into a french fryer.

GAS Transmission and Conditioning Section



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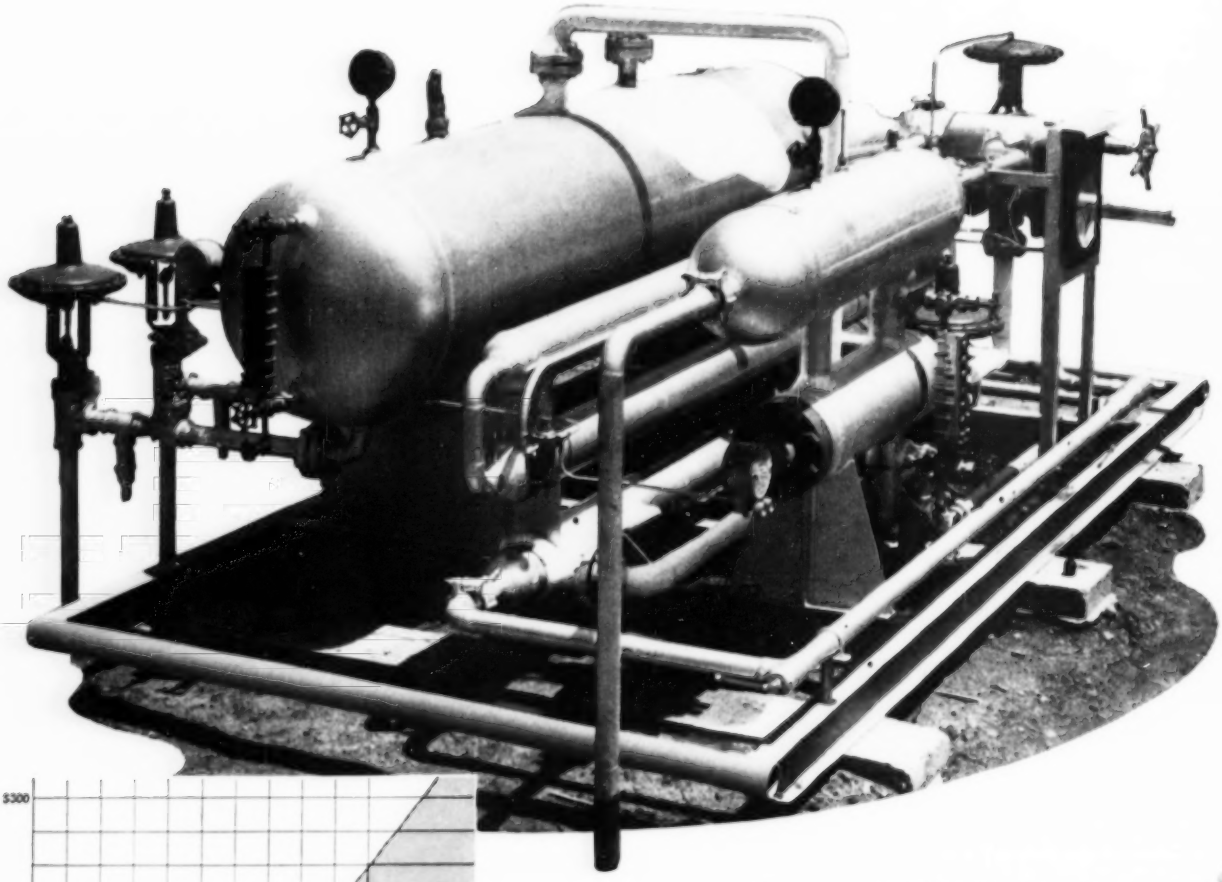

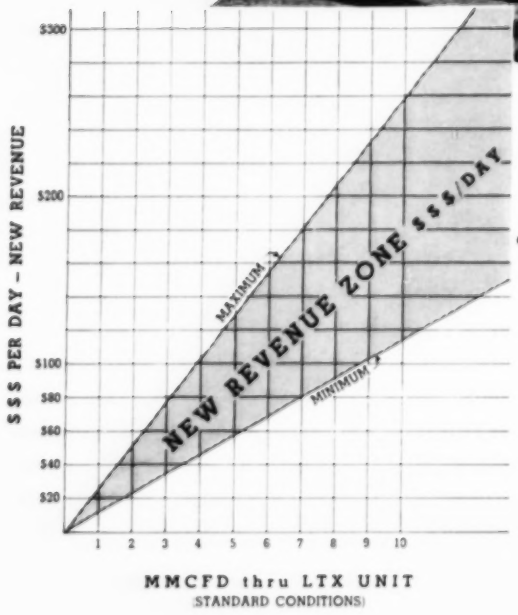

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This is the first of two 10 MMCF, 1000 psi National LTX Units set on a lease in East Texas. Production figures reveal that the well made 9 bbls. of distillate per MMCF on potential test through standard separation. After setting the National LTX, production increased to 15 bbls./MMCF. The operator flows 4 MMCF/day. This means an increase in distillate recovery of 24 bbls./day valued at approximately $66.00 or $24,090.00 per year.

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"big news" The plan of action

A new pipeline code awaits industry acceptance

By **CHARLES T. SCHWEITZER** • Secretary, Subcommittee 8

THE tremendous expansion of the gas industry during the past few years has resulted in the use of some 350,000 miles of mains and pipelines to bring natural gas to millions of customers, many of which are centered in the most densely populated areas of the country—a fact that has led the industry and the various governmental bodies which regulate it to recognize the importance of the safety of these facilities.

Consequently, an industry effort to revise the existing Code for Gas Transmission and Distribution Piping has been undertaken by Subcommittee 8 of the American Standards Assn. Sectional Committee B31.1. It is estimated the second draft of the new code will be completed this month and distributed to committee members for approval. When finally approved by the industry and the ASA, it will provide an up-to-date set of safe practices regulating the construction, maintenance, and operation of gas pipelines.

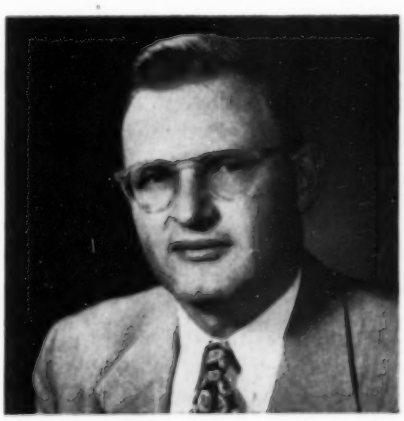
Statistically the gas industry has a safety record that is to be considered one of the best in terms of the small loss of life and property with respect to the expansive scope of the industry and the large amount of energy handled. During the recent period of rapid development, however, a few gas transmission line blowouts and distribution system failures which were of a particularly spectacular nature drew widespread publicity and public attention.

As a result, regulatory bodies in particular were led to become more aware of the importance of safety in the operation of gas transmission and distribution facilities. Several states, including Connecticut, Massachusetts, New York, New Jersey, Wisconsin, and Michigan, have set up regulations with respect to design, construction and operation of gas pipelines. In addition to these state regulations, a bill was introduced in the House by Representative Heselton which proposes to give FPC power to regulate construction of interstate pipelines.

The gas industry as a whole was quick to realize that if each of the 48 states promulgated its own rules the industry could be subjected to many different and perhaps conflicting regulations insofar as pipeline construction practices are concerned. In an effort to forestall any such possibility, the American Gas Assn. requested the American Standards Assn. to review the present piping code, which has been in use since 1937, with the purpose in mind of arriving at a code that would meet present-day requirements. A subcommittee was established within the ASA to carefully review the existing code covering gas transmission and distribution facilities, and to expand and revise it in order to develop a code that would more adequately cover the safe design, construction, maintenance, and operation of gas pipeline systems. The proposed new code should, in addition, be one that would be acceptable to legislative bodies that find a need for establishing their own regulations.

The group which is charged with this responsibility is known as Subcommittee 8 of the American Standards Assn. Sectional Committee B31.1 Code for Pressure Piping. It was organized and started its work in May 1952.

The subcommittee proceeded to prepare a first draft of the code which was reviewed and voted on by the membership in the spring of 1953. In June 1953 a meeting of subgroup chairmen was held to discuss the results of the vote, determine on what issues there



Charles T. Schweitzer, author of this article, is a staff engineer for Southern California Gas Co. and acts as secretary of Subcommittee 8.

Frederic A. Hough, vice president of Southern Counties Gas Co., is chairman of Subcommittee 8 of the American Standards Assn.

GAS exclusive

were major differences of opinion, and see if new proposals that may be generally accepted could be prepared on some controversial issues. Certain revisions were suggested and presented at a full subcommittee meeting the following month.

Following this meeting, in which the major controversial issue was a definition of where hydrostatic testing should be used, a second draft of the code was undertaken. This draft, it is hoped, will be ready for submission to the full membership of the subcommittee early this month. A ballot will be taken on each paragraph after the members have had an opportunity to give it sufficient study. If approved by members of the subcommittee, the code will then be presented to the ASA for approval, after which it will become a new gas transmission and distribution piping code.

Organization

The range of interests that has been brought together in the selection of the membership of Subcommittee 8 indicates something of the scope of the new code, and the various industries and agencies interested in its development. Careful consideration was given to the selection of members in order that any industry related to the gas industry, as well as the gas industry itself, would be adequately represented. The 68 member subcommittee is divided among the following groups:

Long-line transmission companies	13
Combination transmission and distribution companies	13
Distribution companies	8
Pipe and steel manufacturers	8
Consultants	4
Engineering and contracting firms	12
Insurance organizations	1
Valve and fitting manufacturers	3
American Petroleum Institute	2
Governmental agencies	4

Fred A. Hough, one of the official AGA representatives on the subcommittee, was appointed chairman. To assist him in administering the activities of the subcommittee, Mr. Hough appointed the following officers and subgroup chairmen:

Walter H. Davidson, chairman.
Charles F. de Mey, chairman.
Charles T. Schweitzer, secretary.
Subgroup chairmen:
Stephen A. Bergman, Panhandle Eastern Pipe Line Co.
Walter H. Davidson, Transcontinental Gas Pipe Line Corp.
Charles F. de Mey, Columbia Gas System Service Corp.
John F. Eichelmann, El Paso Natural.
M. C. Madsen, Northern Natural Gas.
B. T. Mast, Tennessee Gas Transmission Co.
F. G. Sandstrom, Consolidated Edison Co. of N. Y. Inc.
Roscoe D. Smith, Pacific Gas & Electric.
Frank S. G. Williams, Taylor Forge & Pipe Works.

The machinery of the American Standards Assn., which may be used by an industry to arrive at a suitable set of standards governing its own operation, was put to use in the preparation of the code. With respect to the operation of the ASA, it should be pointed out that projects of this nature are undertaken only upon request, and only when it can be shown that there is sufficient industry interest to justify the project.

Walter H. Davidson, general superintendent of Transcontinental Gas Transmission Co., is vice chairman of Subcommittee 8 and heads a subgroup on construction and operation.

Differences of opinion with respect to elements of the code must be resolved in sectional committee meetings or conferences, and substantial agreement reached on all items before it is submitted to the Standards Council and Board of Review of the ASA for approval as an American Standard. It is an important function of the council and the board to act in a judicial capacity to see that a consensus has been reached among subcommitteemen.

The Sectional Committee B31.1 Code for Pressure Piping of the ASA is sponsored by 37 organizations. The organizations most closely related with the project are AGA, American Society of Mechanical Engineers, American Iron and Steel Institute, and Cast Iron Pipe Research Assn. The administrative sponsor of the group is the ASME. The functions of the administrative sponsor are to arrange for the official appointment of members and make necessary arrangements for the administration of the work. Subcommittee 8 is but one of several groups operating under the jurisdiction of Sectional Committee B31.1. Because of its interest in the program, the AGA has taken active part in the sponsorship, staff duties and financial support of Subcommittee 8.

Money for carrying on the work of the subcommittee has come from several sources. The AGA, through its PAR program, has appropriated $100,000 for special research projects related to the work of the code. In addition, the five major steel and pipe manufacturers have contributed $55,000 toward these research programs.

In addition, the AGA provides financial support to secure the services of outside consultants on some of the technical phases of the work and for conducting several technical studies and reports. The ASME has underwritten the cost of printing the second draft of the code and will make provision for printing the final draft of the code along with handling all sales. Companies having members on the subcommittee have generously contributed the time and expense of these members in carrying out the work of the subcommittee.

Controversial issues

Copies of the first draft of the code were distributed in May 1953 to members of the committee only for their review and comment. Ballots were prepared so that each member could vote on individual paragraphs. In addition, it was requested that any negative vote be accompanied with a reason. Sixty-one out of 67 committee members returned ballots. Because there was a total of 379 items on which to vote, a considerable amount of work was in-

F. G. Sandstrom, engineer for Consolidated Edison Co., is chairman of a subgroup on distribution.

volved in compiling the results of the voting. Included with the ballots, over 1250 comments were received which ranged from minor editorial changes to basic differences in principle.

The voting indicated that encouraging progress had been made in that general approval of the code was indicated by a majority approval of all paragraphs. However, the voting did indicate some major differences of opinion. Some of the major differences of opinion which were again brought out in the last subcommittee meeting in July 1953 centered around these subjects:

1. *Pipe specifications.* Restrictions on the carbon and manganese content, and the setting up of a ratio of actual yield to ultimate strength in an effort to minimize the hazard of brittle failure and to improve weld ductility. Although there are many factors that effect steel behaving in a brittle manner, it is recognized that carbon content has one of the dominant effects and it is also one of the constituents that can be controlled. The first draft of the code prescribed a lower limit for carbon for cold expanded pipe that is less than the usual specification to which pipe is purchased. Controversy developed over the amount of this reduction, the possibility of additional cost of steel, and the necessity of reducing carbon. The second factor is to maintain a margin between the yield strength and ultimate strength to provide a specified ductility before failure. It was reported at the last committee meeting that the API specification committee is considering a modification of maximum carbon content in the API 5LX specification and a requirement for ratio between yield strength and ultimate strength. However, the second draft of the code will probably be printed before the API 5LX specification can be changed and will therefore contain special requirements for cold expanded pipe.

2. *Joint efficiencies.* The question here was how the code should consider joint efficiencies of welded pipe and what, if any, supplemental tests should be required to prove the strength of the weld. Joint efficiencies of the longitudinal weld of welded pipe have been the subject of various interpretations. The present code lists a table of efficiencies from .60 to 1.00 for various kinds of pipe with the provision that if supplemental tests are made on some kinds of welded pipe the joint efficiency can be used as unity. The type or number of such tests is not prescribed. Some companies use the joint factor as listed, others make varying numbers and kinds of tests to uprate the joint, while still others use a joint factor of 1.00 on the assumption that the manufacturers make supplemental tests. If supplemental tests are required a testing program based on some statistical analysis must be developed in order that the results of a sampling technique would assure that pipe not tested would be satisfactory. Other suggested methods of qualifying welds include testing pipe to yield strength after installation, 100% nondestructive inspection at the pipe mill, and relating the joint efficiency to mill test pressure.

Frank S. G. Williams, manager of engineering services for Taylor Forge and Pipe Co., heads the Sectional Committee B31.1 of the ASA and is also chairman of the subgroup on fabricating details and mechanical design.

3. *Hydrostatic testing.* The problem here was under what conditions of exposure to the public hydrostatic testing should be used. It was generally agreed that hydrostatic testing should be used on all pipeline operating at a pressure of over 30% of its specified yield strength when constructed in areas where there is an appreciable exposure to the public. However, agreement was not reached on how to define an area where public exposure would be sufficient to require a hydrostatic test. In an effort to resolve this problem, a new subcommittee was appointed under the chairmanship of Walter H. Davidson to investigate the problem and make recommendations.

Following the Santa Monica meeting, a larger editorial group started the preparation of a second draft of the code. This group was made up of A. H. Cramer, F. A. Hough, R. J. Love, consultant to the committee, C. T. Schweitzer, B. T. Mast, F. S. G. Williams, and W. E. Wilbur, consultant to the committee. As this draft was under preparation it was reviewed by subgroup chairmen and, in particular, with those chairmen who were especially interested in certain phases of the code.

Investigation of secondary stresses

Usually a pipeline is designed on the hoop stress resulting from the internal pressure, although there may be other stresses resulting from seasonal temperature changes and traffic impact loads on buried pipe. In order to analyze these secondary stresses a special committee under the chairmanship of B. T. Mast, Tennessee Gas Transmission Co., was established. The work of the committee has been divided into two parts with the first phase having to do with stresses in aboveground piping, and a second with underground piping. It was found that there was considerable information available on aboveground piping but there was lack of correlation in the material. The committee plans to analyze and calculate all combinations of loadings to pipelines covered by present theories and evaluate their relative importance. Where the stresses appear to be significant a sufficient amount of research will be undertaken to justify the theory. If there appears to be considerable difference between the theory and the results of research, an intensive program will be instigated to develop a new theory for the particular condition.

Pipeline field and laboratory research

One of the major problems confronting the committee was the consideration of those pipeline failures which resulted in a brittle fracture of the line. Failures as long as 3000 ft have resulted where transmission lines have failed in a brittle condition. The subject of brittle fracture is not a new one as many similar failures have occurred in welded ships and steel tanks, and considerable research has been done on the problem. The brittle fracture of a pipeline, however, is a specialized problem in many respects. At the same time there is a lack of correlation between laboratory tests to determine the impact values of steel and the manner in which steel reacts in the field. To make a study of this problem a subgroup was established under the chairmanship of C. F. de Mey. This project is divided into a laboratory and a field testing program.

The laboratory phase consists of the preparation and testing of approximately 2500 Charpy specimens representing pipe of current production from the major pipe manufacturers in an effort to show the relationship between temperature and impact strength. This work is under way at Armour Research Foundation in Chicago.

The second phase consists of field tests on 30-in. diameter pipe. In these tests a failure will be initiated in a test section under different conditions of temperature and stress. The behavior and cause of the failure can in this man-

ner be analyzed and the relationship between transition temperatures on laboratory tests and the behavior of the full scale pipe specimen in the ground can be established. Once this relationship is established more specific details can be determined from laboratory tests. Additional tests will be made to study the relationship of the failure to temperature, pressure, chemistry of the steel, diameter and wall thickness of the pipe. Preparations for these series of tests are now under way* near Athens, Ohio, and are being conducted under the direction of Battelle Memorial Institute.

The first draft of the code, distributed to members in April 1953, was divided into the following nine chapters:

1. Introduction.
2. Material.
3. Design.
4. Installation.
5. Testing After Completion.
6. Operating and Maintenance Procedure Affecting the Safety of Gas Transmission and Distribution Facilities.
7. Liquefied Petroleum Gas (LPG) Systems.
8. Pipelines on Rights of Way of Electric Transmission Lines.
9. Appendix.

Suggestions were made during the meeting that a more usable arrangement of the subject matter might be worked out and during November the code was rearranged in the following order:

1. Introduction:
   Scope, Definitions, Standards.
2. Materials and Equipment:
   Qualification, Specifications, Identification.
3. Welding:
   Procedure and Welder Qualifications, Standards of Acceptability.
4. Piping Components and Fabrication Details:
   Valves, Flanges, Branch Connections.
5. Design, Installation and Testing:
   Stresses, Construction Procedures, Testing, Etc.
6. Operating and Maintenance Procedures Affecting Safety.
7. Miscellaneous:
   Odorization, Liquefied Petroleum Gas Systems, Lightning Protection.

The latter arrangement provided easier access to the subject matter contained in the code. Except for those paragraphs which have to do with areas where hydrostatic testing will be mandatory, the second draft of the code is in its final stages of completion. However, it is hoped that this final issue will be resolved in order that the draft will be ready for distribution to members of the committee in its final form early this month.

*See November *GAS*, page 87.

Burton T. Mast, supervising engineer for Tennessee Gas Transmission Co., of Houston, Texas, is chairman of a special committee under Subcommittee 8.

Mechanics of approval

After the second draft of the code has been distributed to subcommittee members and sufficient time has been allowed for review, a ballot will be taken on each paragraph. If it is found that major differences still exist, additional meetings, research, fact finding, and other steps will be taken to resolve the differences. However, if the code is approved by the members it will be submitted to the Sectional Committee B31.1 for approval, and then to the ASA Board of Review. Upon ASA approval, the ASME will issue the code as the new Section 8 Gas Transmission and Distribution Piping code.

It is expected, however, that after the code is adopted there will be additional problems of interpretation, and revisions and additions. Subcommittee 8 will be a continuing body to handle these problems although its size will be materially reduced.

The free exchange of ideas and practices between members of the committee has been one of the most outstanding results of the subcommittee meetings. Of nearly equal importance has been the interest shown by members of the committee in material on the subject solicited from consultants and other various experts, and the knowledge they have gained from contact with this material. Terms like carbon equivalent, impact strength, notch toughness, transition temperature, and brittle fracture have been specifically defined in working out the code.

The practical and technical talent that has been brought together by the committee during the course of its work far exceeds the background and resources that could have been brought to bear on a problem of this nature by any one company or research organization. It has been estimated that the salaries and expenses of the persons in attendance at a single meeting would be approximately $35,000.

Study of pipeline failures

It was evident at the beginning that a careful review of past failures must be made to determine, if possible, the basic cause of the failure. This information would then be used by the committee in working out code requirements that would minimize the possibility of additional failures because of similar reasons. S. A. Bergman of Panhandle Eastern Pipeline Co. was designated as chairman of a subgroup to study these failures. He was assisted in the evaluation of data and preparation of a report by G. M. McClure of Battelle Memorial Institute.

A report was presented on this subject to the committee at the Santa Monica meeting. It summarized 1376 failures reported by 46 companies Only those failures occurring after 1930 on pipelines operating at over 100 psi were considered. Each failure was tabulated according to its cause. The two most prevalent types of failures were those which occurred in the longitudinal pipe weld and those which occurred in a field-made circumferential girth weld.

Study of chemical and physical properties of pipe

Early in the program it was suggested that a great amount of worthwhile information might be available from the mill test reports of pipe used. It was agreed that a statistical analysis of the chemical and physical properties of the pipe should be made, and Prof. E. C. Wright of the University of Alabama was selected to compile and analyze this information. Professor Wright's report included pipe from 16-in. to 30-in. in diameter with the largest portion being X52 welded and expanded pipe. His report showed the distribution of carbon and manganese content, the yield strength and tensile strength of hot rolled plate, the effect of cold work on chemical properties of the pipe, and the carbon equivalent of the pipe.

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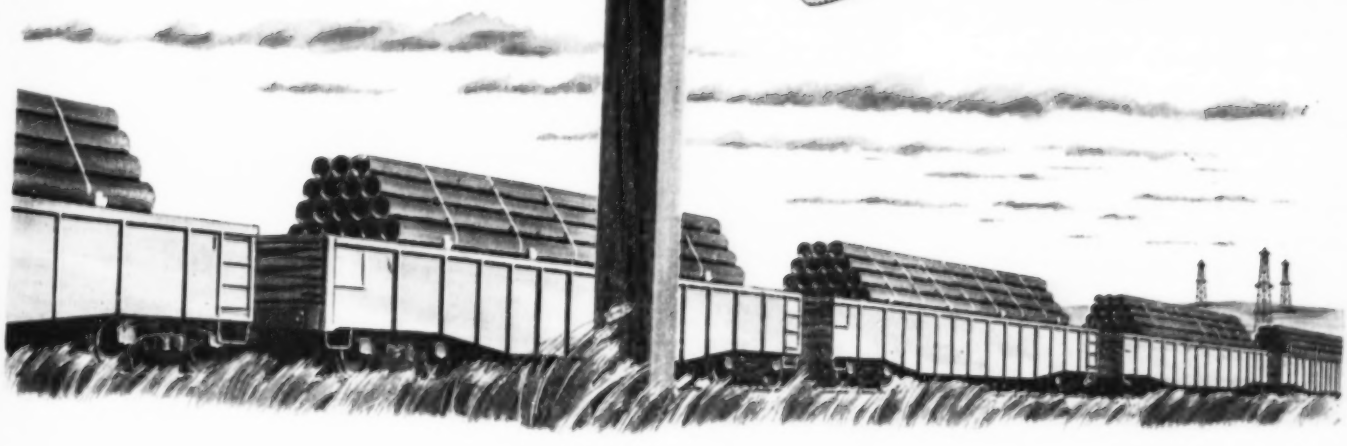

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Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
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"big news"

The new technique

Hydrostatic testing:
Economies, problems and procedures

By J. C. POWELL and N. K. SENATORFF

THE work of Subcommittee 8 of American Standards Assn. Sectional Committee B31.1 in behalf of a set of safe practices for the construction, maintenance, and operation of gas pipelines has led to the widespread discussion of hydrostatic testing as a standard procedure. The subcommittee, in its revised version of the Code for Transmission and Distribution Piping, proposes to require the use of hydrostatic testing on those pipelines which transverse certain specified areas primarily because of the comparative safety involved in testing pipelines with water and because of the more rigorous test to which the line may be subjected by the use of water at high pressures.

Since the industry is generally aware of these advantages of hydrostatic testing, the discussions as to its use have revolved around the extent to which it should be specified as a required procedure and the problems presented by its application.

Although the hydrostatic testing of gas pipelines is not a new practice, having been used extensively by some companies for more than 20 years and to a limited extent by most companies operating high pressure gas facilities, it is not used as extensively as gas pressure testing because of the comparative simplicity of a gas test. A gas pressure test involves inspection of the line for leaks or defects while pressurized at 50 psi or 10% above maximum working pressure. Upon completion of the test, line pressure is dropped to the maximum operating point and line is put into use.

Hydrostatic testing, on the other hand, involves filling the line with water, a section at a time, with a high capacity fill pump, and then pressurizing the line to a specified test pressure with a high pressure pump. Test pressure, which is considerably higher than maximum working pressure in the case of a hydrostatic test, is maintained for a period of time. A line leak is indicated by a drop in pressure, and the size of the leak by the pumping rate required to hold the test pressure. The actual location of the leak may be found by patrolling the line for wet spots and washouts in the backfill. After completion of the test the line must be cleaned of water before it can be put into use.

Compared with a gas test, hydrostatic testing even under the most favorable conditions is a complex and costly procedure. Under unfavorable conditions resulting from lack of planning, lack of experience, adverse weather conditions or mountainous terrain, the operation can become very costly and involved. Industry reaction to hydrostatic testing has often been based upon testing under such unfavorable conditions.

Mr. Powell (left) is assistant research engineer at Southern California Gas Co. and Mr. Senatoroff is a chemical engineer at Southern Counties Gas Co.

Consequently, it is of importance to the industry to understand the problems associated with hydrostatic testing and to search for practical solutions to these problems. A prerequisite, however, is a thorough and unbiased study of the basic technique of hydrostatic testing, and an intimate knowledge of its practical application to specific pipeline problems.

Cost of Hydrostatic Testing. The cost of hydrostatic testing will vary considerably depending mainly upon the length of line and the adequacy of the equipment used in testing. Costs of from 10 to 50 cents per foot have been reported by some companies for large diameter pipelines. It is obvious that for a short length of line the cost will be high on the per foot basis because a large part of the cost is involved in preparation for the test.

Inadequate equipment and failure to design the pipeline so that it can be easily tested are very important factors in the cost of hydrostatic testing. Too often fill pumps with low capacities and discharge pressures are used, and the filling operation takes an unreasonably long time without filling the section sufficiently so that the high pressure pumps can rapidly complete the filling to the test pressure.

The argument is offered that hydrostatic testing delays completion of the line, and the loss of revenue makes the cost of testing high. It is believed that, by adequately planning the testing as part of the pipeline construction, there will be no significant delay, and, in fact, in many cases less delay will be encountered than if a gas test were made.

(Planning the test)——→

This is a pre-publication paper to be presented at a meeting of the PCGA this spring.

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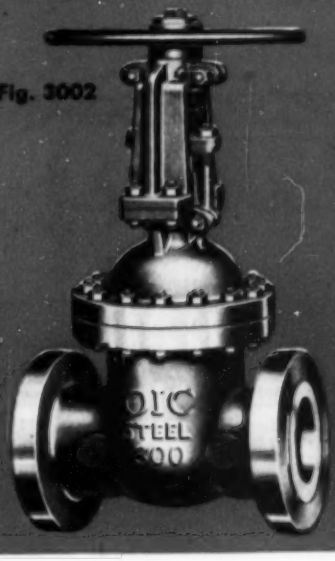

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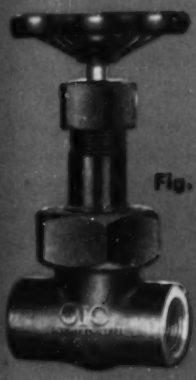

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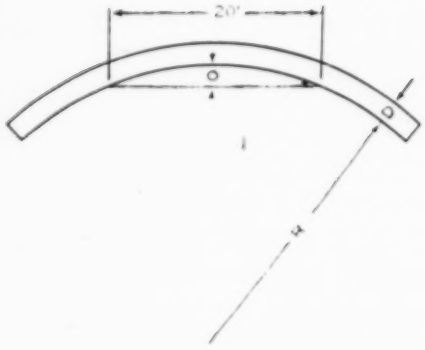
Planning the hydrostatic test

Each step in the planning and carrying out of a pipeline construction project is important if the successful operation of the line is to be assured. Delay and added expense in the completion of the line and putting it into service frequently results when hydrostatic testing is not considered a part of the construction project and not adequately provided for in the planning stages.

If, however, during the design and planning stages of a pipeline project, attention is given to details which are related to the testing program such as the location of vent valves, availability of water for the test and suitable fill and pressurizing pumps, hydrostatic testing can be done without difficulty and at a reasonable cost. The necessity for this kind of planning to assure a smooth and economical execution of the testing program cannot be overemphasized.

Advance planning will enable the designer to predict the cost of special equipment needed for the test. It will also permit forecasting the personnel requirements for carrying out the test, and it will provide the opportunity for weighing the relative merits of a company-operated test as against a contract testing program. It will, in summary, substitute a carefully planned and "on schedule" type of testing project for the "fire fighting" type frequently evidenced where the hydrostatic test is conducted as an afterthought.

Planning of this kind will also permit the scheduling of a testing program that may be integrated with a construction project. In such a program the line is tested, section by section, immediately after completion and before the contractor has moved his equipment to another location. If leaks or defects which require repair are found in the line the contractor is available with his equipment on location to do the job.



DIA "D"	RADIUS "R"	MIDDLE ORDINATE "O"
16"	48"	12.5"
18"	54"	11.0"
20"	60"	10.0"
22"	66"	9.0"
24"	72"	8.5"
26"	78"	8.0"
30"	90"	6.5"
32"	96"	6.0"
34"	102"	5.5"
36"	108"	5.0"

Fig. 1. Recommended radii for pipe bends for most effective pig running.

Insofar as the design of the pipeline is concerned, the following things should be considered if a hydrostatic testing program is to be undertaken:

1. *The minimum radii for pipe bends and welding ells.* If conventional pipeline pigs are to be used in the filling operation and in removing the water after test, it is recommended that the pipeline design specify pipe bends with a radius of curvature of at least seven pipe diameters *(see Fig. 1)*. If this is not practical, welding ells of not more than 22½°, with a radius of 1½ pipe diameters, are suggested. However, successful pig running has been reported in pipelines with 10° miters and 90° ells with a radius of 1½ pipe diameters. In such instances the pig design should be checked in order to verify its usability and efficiency for water removal.

2. *Variation in pipe diameter.* The successful transfer of water from one section of the line to another, or the removal of the water after completion of the test, depends to a considerable extent on the uniformity of the pipeline diameter. Small changes in diameter due to a difference in wall thickness are not objectionable. Obviously, however, the indiscriminate use of different pipe diameter sections in which discontinuity of pipe sizes might interfere with the passage of a pig should be avoided. Abrupt changes in size produce pockets in the line which collect water and hinder the complete removal of water at the end of the test.

3. *Size and type of valves and fittings.* For all practical purposes the selection and sizing of valves and fittings should conform to the pipeline diameter. In other words, the use of full opening block valves is preferred over types that constrict the pipeline diameter. If full opening valves are not provided, it will be necessary to sectionalize the line between mainline valves for testing purposes. It is possible, of course, to install

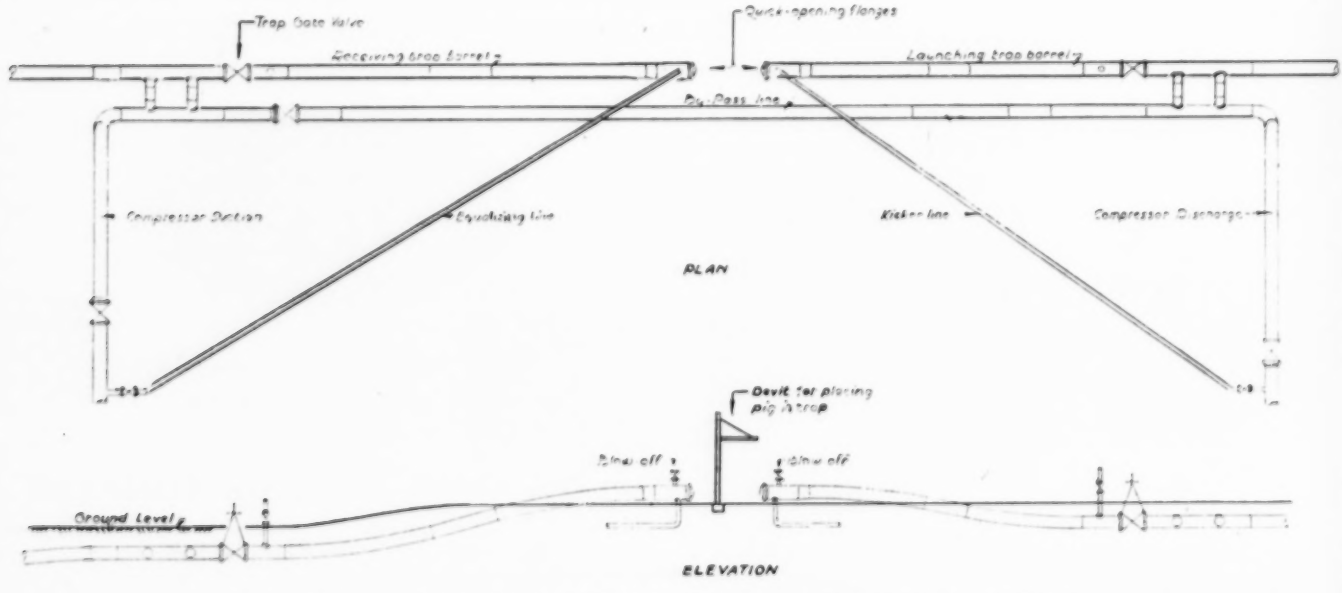


Fig. 2. Permanent pig trap at compressor station for on-stream pigging of the line.

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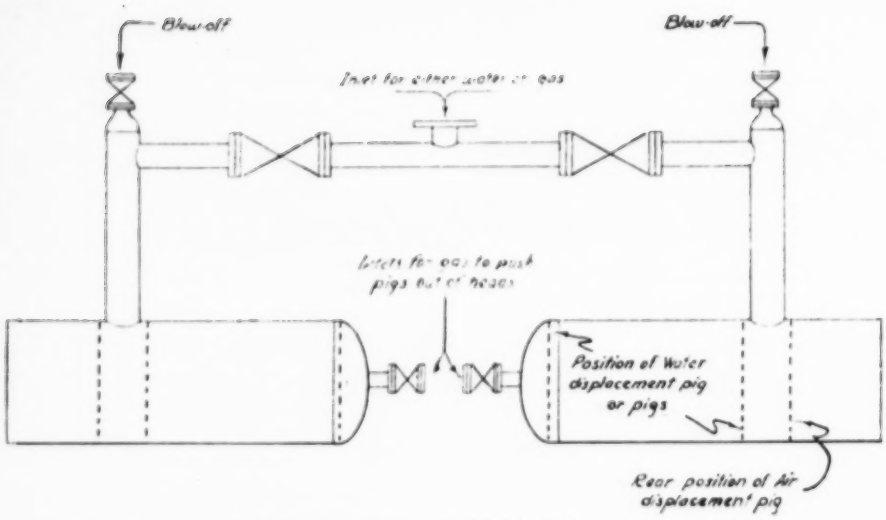
Blow-off
Blow-off
Inlet for either water or gas
Inlets for gas to push pigs out of heads
Position of water displacement pig or pigs
Rear position of Air displacement pig

Fig. 3. Launching heads and manifold for filling two test sections.

the valves after the test has been completed, in which case the length of the test section is not affected by the type or spacing of mainline valves.

4. *Pig traps.* In designing natural gas transmission lines in the past, most designers have provided only temporary facilities for launching and receiving pigs. Pigs were primarily intended for either cleaning the lines of construction dirt and water or of dust which accumulated because of internal corrosion resulting from the handling of nondehydrated gas.

Currently, in an effort to maintain maximum flow efficiency, many of the lines in the planning or construction stage include facilities for "on stream" running of pigs as a permanent feature of the line. Such facilities are very useful in the long term operation of the line and tend to reduce the cost of a hydrostatic testing program when several pig runs are contemplated.*

Obviously, no one single on stream design will be the best for every pipeline. Most of the users of pipeline pig traps report, however, that the horizontal type is preferred to the vertical for both suction and discharge piping in compressor plants.

The trap consists of a launching and receiving section of pipe (the so-called trap barrels) mounted aboveground with davits, quick-opening flange, trap gate valves, bypass, blowdown lines and the "kicker" lines for dispatching the pig *(see Fig. 2).*

The following special temporary fittings, equipment, and considerations are essential for ease and convenience in hydrostatic testing.

1. *Manifolds and launching and receiving heads.* Four designs for manifolds and for launching and receiving heads are shown in *Figs. 3, 4, 5,* and *6.* The arrangement in *Fig. 4* is for filling two sections in opposite directions. A means for transferring water from one section, that has already been tested, into another section to be tested is shown in *Fig. 4.* An arrangement for filling at one end of a section only is shown in *Fig. 5,* and *Fig. 6* shows a launching manifold and head for separately running several pigs.

2. *Pipeline pigs.* The latest pipeline pigs are designed to "flow through" most of the properly sized and installed fittings and full opening valves.

Many different types of pigs are currently available from manufacturers such as T. D. Williamson Inc. of Tulsa, and Cleaner Pipeline Co. of North Kansas City, Mo.

3. *Pumps for filling and pressurizing the line.* Filling large-diameter pipelines with water requires high capacity pumps which also provide ample lift to meet the static heads encountered in the terrain over which the pipeline may extend. A truck mounted 3-stage Peerless centrifugal pump with 1000 gpm capacity against 350 psi static head, or 1200 gpm capacity against 200 psi has proven to be very satisfactory for this purpose. In practice a pump of this kind can be driven by a diesel engine capable of delivering 185 bhp.

In addtion, a high pressure pump is required for the pressurizing operation. A pump rated at 95 gpm with a maximum pressure rating of 5000 psi is suitable for this purpose. This pump and its prime mover should also be truck mounted for easy mobility. The truck should also contain a fairly large capacity water tank.

In sizing the fittings and connecting

*"Economics of Internally Cleaning Gas Lines During Operation," E. T. Robinson Jr., *Oil and Gas Journal,* July 27, 1953.

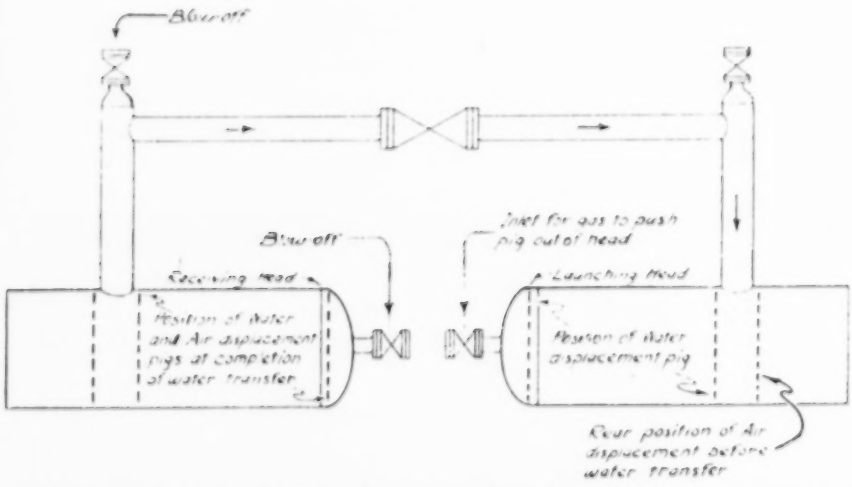
Blow-off
Inlet for gas to push pig out of head
Blow-off
Receiving Head
Launching Head
Position of Water and Air displacement pigs at completion of water transfer
Position of Water displacement pig
Rear position of Air displacement before water transfer

Fig. 4. Launching and receiving heads with manifold for water transfer from one test to another.

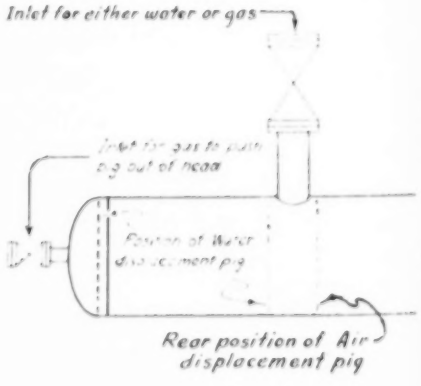
Inlet for either water or gas
Inlet for gas to push pig out of head
Position of Water displacement pig
Rear position of Air displacement pig

Fig. 5. Launching head equipped for filling of one test section only.

lines for filling purposes it is important that they be large enough to handle the needed volumes of water or gas without undue pressure drop. From past experience it has been learned that sizing of equipment for the expected average filling rate is not adequate. Some allowance in capacity must be made for peak rates of filling. In some instances the recommended oversizing of equipment approached 35% above an estimated figure based on the average rate. This added capacity has proven valuable at times of emergency such as the unexepected approach of bad weather and the breakdown of other equipment. In sizing gas connections, ample excess capacity should be provided to overcome serious leakage past a stuck pig and to allow the build-up of sufficient pressure differential to force the pig past an obstruction.

4. *Water supply and disposal sources.* A survey of the quantity and chemical analysis of the water along the pipeline right of way should be undertaken as a part of the construction planning. It is also advisable to survey the line for means of disposing of the water at the conclusion of the test. In the latter instance it should be pointed out that some states require that water, after the test, be returned to the stream from which it was initially taken. An estimate of the quantity of water required for a test and the time required for filling a test section is shown in *Table 1.*

The selection of a convenient water supply in relation to the pipeline test sections, railroad and highway crossings, and compressor station locations is an important consideration. It is also important that a site be selected that will permit a suitable degree of coordination between the testing program and the general construction schedule.

A suitable source of water and a satisfactory means for its disposal in some instances appear to be difficult requirements to satisfy. There are reported cases, however, where the problem of a limited water supply was solved by transferring the water with proper tie-ins of manifolded sections of the line and re-using it for hundreds of miles from the initial source of supply. In such instances, adequate fill pump capacities and coordination of construction and testing scheduling were required to make the job possible.

5. *Elevation profile.* The engineer in charge of the testing program should have a detailed profile of the line because of the necessity, particularly in mountainous country, of carefully sectionalizing the line in order to subject all parts of the test section to an adequate pressure without overstressing the low points of the line. A profile of the line is also required in the selection of adequate equipment for filling and pressurizing the sections.

Altimeter readings along the right of way should be used for the engineer to plot the expected static pressures against the footage of the sections. A volume scale can also be superimposed on the footage scale in order to provide quick estimates of water volume required to fill the line to any given point. The plot should also indicate exact locations of block valves, welding ells, pipe bends, pig traps, water sources and water disposal facilities for the quick preparation of sections for hydrostatic test. With all information readily available, the engineer in charge can determine the best way of sectionalizing the line for hydrostatic testing.

The pipeline company may obtain all the above described testing facilities and carry on its own hydrostatic testing program. However, in those instances where a company does not have sufficient testing work to keep its equipment and facilities occupied a large part of the time, it might prove cheaper and more convenient to contract the testing operation under the direction of a company engineer. The Williams Pressure Service Co., of Shreveport, La., for example, will undertake a complete testing operation including the running of water and altimeter surveys along the pipeline right of way.*

TABLE 1. PIPELINE CAPACITIES AND FILLING TIME

(Per mile vs pipe size for 1000 gpm filling rate)

Size OD (In.)	Capacities — Gal. Per 1-Ft Length	Capacities — Gal. Per Mile	Time in Hours Per Mile
16	9.84368	51,971.04	0.87
18	12.50656	66,033.44	1.09
20	15.44620	81,554.44	1.36
22	18.67756	98,616.32	1.64
24	22.22308	117,331.28	1.96
26	26.06032	137,594.60	2.29
28	30.20424	159,473.60	2.65
30	34.63240	182,856.08	3.04

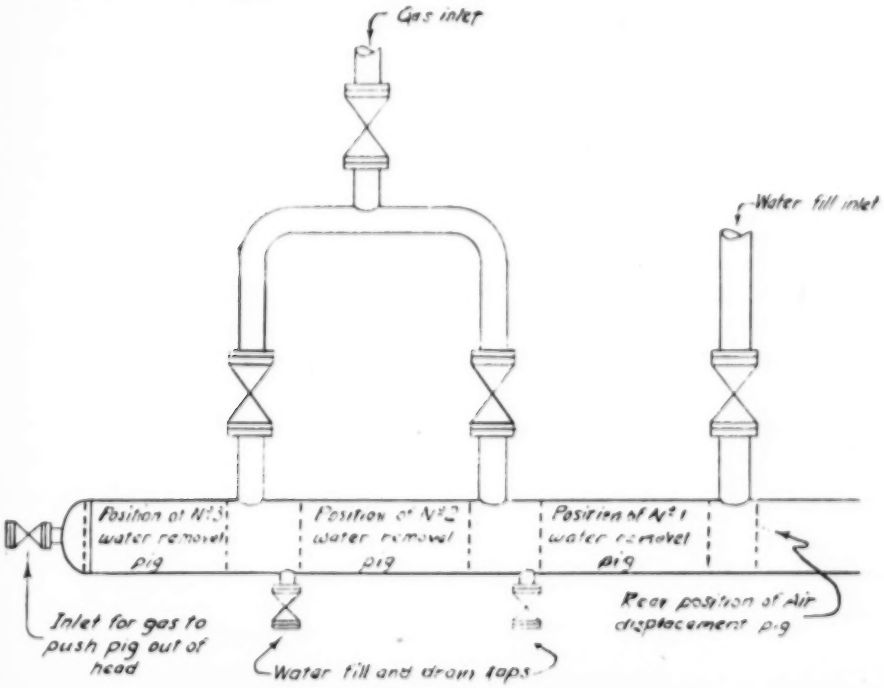
Gas inlet
Water fill inlet
Position of N°3 water removal pig
Position of N°2 water removal pig
Position of N°1 water removal pig
Rear position of Air displacement pig
Inlet for gas to push pig out of head
Water fill and drain taps

Fig. 6. Multiple pig-launching head and manifold.

*See "Packaged Technique for Hydrostatic Testing of Pipelines" by Leon Brooks, December *GAS*, page 95.

Test procedure →

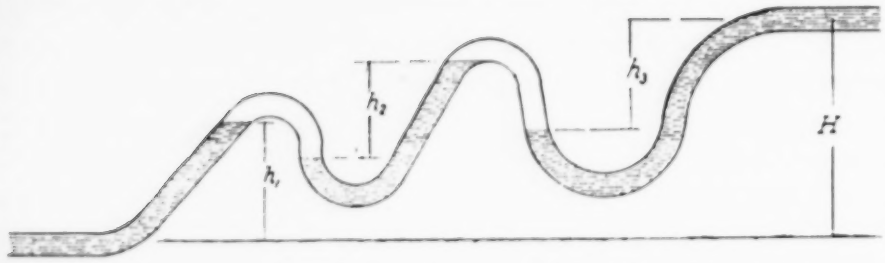

Fig. 7. Diagram showing effect of air and water together in pipeline over mountainous terrain on pump pressure required to obtain flow of water. With line completely filled with water, pump only has to pump against head pressure "H"; with air in the line, pump has to pump against a head pressure equal to h_1, h_2, and h_3.

Hydrostatic testing procedures

Test pressures. Section 8 of the existing American Standard Code for Pressure Piping (ASA B31-1-1951) stipulates that a pipeline in cross-country gas transportation systems shall, after installation, be capable of withstanding an internal fluid pressure of 50 psi greater than the maximum service pressure and, where an internal fluid pressure test is made, the pressure shall not exceed 50 psi over the maximum working pressure or 120% of the maximum service pressure, whichever is the greater. For piping systems within the legal boundaries of cities or villages the system shall be capable of withstanding a pressure of 150% of the maximum service pressure and, where an internal fluid pressure test is made, it should not exceed 150% of the maximum service pressure. The first draft of the proposed 1954 version of this code, however, limits gas or air test pressures to 110% of the design pressure and permits, but does not require, hydrostatic testing to the yield strength of the pipe.

Water filling operation. Heads or traps and manifolds are welded on to each end of the section of the line to be tested. The test section may be as long as 50 miles, although a shorter section is preferable to minimize wear on the pigs used in cleaning and filling operations. Before the head is welded to the end of the line where the water is to be introduced a multiple cup type pig is placed inside the line. A second pig is placed inside the head in such a manner that the water inlet will be between the two pigs. The second pig will be used in displacing the water at the completion of the test. As water is pumped into the connection between the two pigs, one pig will be forced through the line displacing the air through a blow off at the far end of the section.

Often in filling a line that passes through mountainous country the pressure required becomes greater than that computed for the observed difference in elevation. An explanation given for this is to the effect that a pig with a water column behind it may coast down hill faster than the water fill rate, which results in an air trap at the crest of the hill if there is any entrained air with the water. A series of such traps will cause the elevation head pressures at several hills to become additive, and the fill pressure required may become greater than the discharge pressure of the fill pump. This condition is shown diagrammatically in *Fig. 7*. To avoid this trouble a fill pump with a maximum discharge pressure well above the maximum elevation head pressure for the line under test should be used, and care should also be taken to eliminate all air that may have become entrained in the water during the filling process. Air is often introduced if the water to the fill pump contains bubbles of air or the supply of water is inadequate.

After the water-driven pig has entered the receiving head at the end of the test section, indicating that the section is filled with water, the pressure in the section is brought up to the maximum discharge pressure of the fill pump. At this stage a high pressure fill pump is an advantage in the filling process, especially if any air has gotten into the line along with the water. If air that gets into the line when a break occurs is not completely vented, a high pressure fill pump saves considerable time in pumping in more water to initially compress the air to a pressure and volume so that the low capacity pressure pump can again directly bring the line to test pressure.

A small amount of air in the line under test does not appear to create a problem or hazard in the testing process. If a break should occur, the water has sufficient inertia to prevent violent action at the scene of the break. However, the time of water discharge is prolonged directly as the amount of air under pressure, and hence, the break becomes more spectacular as the proportion of air is increased and the possibility of damage is accordingly greater.

Climatic conditions for hydrostatic testing. Hydrostatic testing has been successfully conducted in very cold weather when the atmospheric temperatures have been as low as 5° F below zero. However, no testing has been done with ground temperatures at pipe depth below freezing, although ground temperatures have been as low as 35° F.

It is the consensus of several companies that have done a good deal of hydrostatic testing that it would not be feasible to hydrostatically test a pipeline with a ground temperature below 32° F. The use of antifreezes has been considered, but the cost would be prohibitive in most cases. It, therefore, is concluded that hydrostatic testing should only be done when the ground temperature at pipe depth is above 32° F. Air temperatures below freezing do not create a serious problem; at most it is only necessary to provide some means of heating or protecting the piping above ground through which the water is pumped or discharged. Freezing air temperatures usually precede freezing ground temperatures by a month or more, and in most cold parts of the United States it is not until December or January that freezing ground temperatures at pipe depth occur.

If only a portion of the length of a

These companies have hydrostatically tested large diameter pipelines:

Oklahoma Natural Gas Co.
Southern California Gas Co.
Southern Counties Gas Co.
Texas Eastern Transmission Corp.
Niagara Mohawk Power Corp.
The East Ohio Gas Co.*
Algonquin Gas Transmission Co.
Arkansas Louisiana Gas Co.
Gulf Interstate Gas Co.
Hope Natural Gas Co.
New York State Natural Gas Co.
Pacific Lighting Gas Supply Co.
Panhandle Eastern Pipe Line Co.
Public Service Electric & Gas Co.
Transcontinental Gas Pipe Line Corp.
United Gas Pipe Line Co.
Wilcox Trend Gathering System Inc.

*The first six companies supplied information for this study.

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*An instance which points up the speed and efficiency with which Williams crews swing into action on a pipeline job occurred several weeks ago. A request for complete hydrostatic test service came from Saginaw, Michigan, at 5 p.m. one Friday. At 3 a.m. the following Wednesday 2 fill units were on the pipeline pumping away, having driven from Shreveport to St. Ignace, Michigan.

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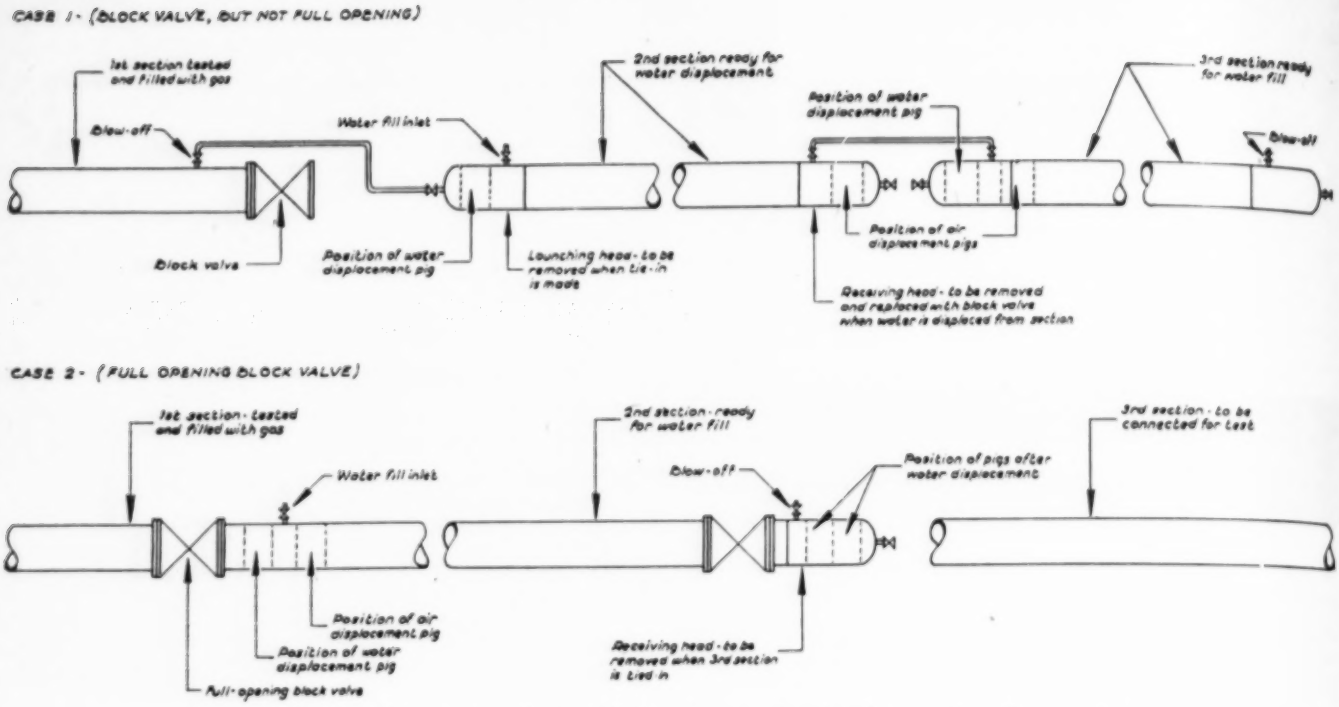
CASE 1 - (BLOCK VALVE, BUT NOT FULL OPENING)
1st section tested and filled with gas
Blow-off
Water fill inlet
2nd section ready for water displacement
Position of water displacement pig
3rd section ready for water fill
Blow-off
Position of air displacement pigs
Block valve
Position of water displacement pig
Launching head - to be removed when tie-in is made
Receiving head - to be removed and replaced with block valve when water is displaced from section
CASE 2 - (FULL OPENING BLOCK VALVE)
1st section - tested and filled with gas
Water fill inlet
2nd section - ready for water fill
Blow-off
Position of pigs after water displacement
3rd section - to be connected for test
Position of air displacement pig
Position of water displacement pig
Full-opening block valve
Receiving head - to be removed when 3rd section is tied in

Fig. 8. Sectionalizing test sections at block valves to minimize the quantity of gas vented.

proposed pipeline is located in areas where freezing ground temperatures might be encountered, the construction schedule can usually be arranged so that those sections of the line are constructed and hydrostatically tested during seasons when freezing ground temperatures do not exist.

Pressurizing the line. With the pipe under pressure exerted by the fill pump the pressure is increased further with a low capacity, high pressure pump until the test pressure is reached. If the pressure tends to drop slowly the pressure is held on the section by continuous pumping and the right of way is inspected for evidence of leaks or breaks by patrolling the line and watching for wet spots or wash outs in the backfill. An airplane has been used effectively in making this initial patrol.

Most hydraulic failures occur in the longitudinal weld usually causing up to 4 ft of the seam to open. In a break of this type the water will wash away the backfill and expose the pipe at the point of failure. At the time of the break no violent action takes place other than the ejection of a stream of water at high velocity, which may be projected as much as 100 ft.

In the case of a break, air is drawn into the line as the water escapes. After the section of pipe containing the break has been cut out and replaced, therefore, it is necessary to pump additional water into the section and either compress the air that has become entrained in the pipe or vent it from the line at an adjacent high point. The latter procedure is considered the better of the two methods.

After a break has been found and repaired, the line is again pressurized to the test pressure and, if no additional leaks are indicated, the pressure is held for a specified period of time. The revised version of the ASA code specifies that the pressure be held for a minimum of eight hours. As an additional means of exposing weak spots in the section a procedure of raising and lowering the pressure several times has been advocated. Holding the pressure for a period of time in excess of eight hours is recommended because experience has shown that some breaks do not show up within an eight-hour period but do occur within a 24-hour period.

Water removal. On completion of the pressure test the water is displaced from the test section by the injection of gas into the line behind the pig, which was originally placed in the head between the fill inlet and the welded end. As gas is injected into the line the rate of pig travel is governed by controlling the flow of water out of the discharge end of the section. By metering the water as it flows out of the line the position of the pig can be determined at any time. With this information the pig can be pushed into the receiving head with as little residual gas pressure as possible in order to reduce the amount of gas blown to the air when the line is tied in. Further, the amount of gas wasted can be held to a minimum if the test sections are initially selected so that a block valve can be placed at the downstream end of the section after it is tested and the water removed (see *Case 1, Fig. 8*). In displacing the water from the next section the gas can be shut off at the block valve so that only the gas in the section under test need be vented at the time of the tie-in.

If full opening valves are used, it is possible to put the pigs in the upstream end of a section to be tested and then permanently connect the section to the line just downstream from the full opening block valve of the preceding section. The section for test can then be filled with water through a tap between the pigs, and after the section is tested the water displaced by allowing gas to flow through the block valve. The pig displacing the water passes through the section and through its block valve into a receiving head which is removed before the next section is tied in. With this procedure it is not necessary to vent any gas (see *Case 2, Fig. 8*).

Sometimes the practice is followed of leaving the water in each section after the test. When test heads are then removed and the sections joined together, a pig is run through the several sections to displace the water in one operation.

Pigging the line →

Pigging the line after test

From laboratory tests it has been determined by the authors that, when the wall of a pipe has been thoroughly wet and then scraped free of all visible water with a rubber plunger, the water retained by the damp wall is of the order of 0.001 lb per sq ft. This figure then represents the ultimate degree of dryness which can be obtained by pigging a line. Data obtained in practice indicate that this degree of dryness may be approached in displacing the water with a pig under favorable circumstances. That is, two pigs should be run together, and each pig should have at least three rubber cups. In addition, the section of line should be 30 miles or less so that the wear of the cups is not enough to reduce their "squeegee" efficiency. The pipe should preferably have long radius bends and have no obstructions where the rubber cups on the pigs could be damaged or deformed allowing water to bypass. Also, the pigs during the water displacement run should be kept in continuous motion.

More water is removed by running several pigs together than by running only a single pig. However, if each of the pigs is run through the line separately, allowing the time between each run for the water to drain to the low places in the line, the removal of water is better than when the several pigs are run together.

Under controlled test conditions a single displacement pig was run through a 2500-ft section of 30-in. pipeline after completion of a hydrostatic test, and after less than 20 hours of operation, the line was found to be thoroughly dry. A dry line was indicated when the dew-point of the outlet gas equalled that of the inlet gas. The actual time required for the line to dry was not known, because the first dew-point test was taken after 20 hours of operation.

In another instance involving the hydrostatic testing of a 24-in. pipeline divided into sections totaling 300 miles, the average amount of water left after the displacement pig run was of the order of 0.02 lb per sq ft of pipe wall area. The ultimate degree of dryness was reached after three more separate pig runs through each 60-mile section. For shorter sections it would be expected that fewer runs would be required; with the possibility of only one additional run required for sections under 20 miles in length.

In still another case a 90-mile, 18-in. pipeline was tested in sections up to 18 miles in length, and water removal was excellent with but a single pig run. Only a few gallons of water was removed from each section by a second pig.

As many pigs as necessary can be run without inconvenience or without a waste in gas after the line is completed and ready for service if permanent pig launchers, traps, full opening valves and long radius bends are built into the line. If such permanent facilities cannot be justified, an alternative can be offered in the form of temporary launching and receiving heads with sufficient capacity to hold as many pigs as desired with manifolding arranged in such a manner that each pig can be "kicked out" into the test section and forced through the line with gas. Launching and receiving heads can be closed by means of Unibolt hinged blank couplings so that pigs can be inserted and removed from the heads as required. This latter method will not prevent a waste of gas.

Each additional run will result in the wasting of some gas. The first may waste the least amount of gas if the gas displaced by the pig is forced into the next test section to displace the water in that section. The gas displaced by succeeding runs, however, will ordinarily be blown to the atmosphere.

One difficulty sometimes encountered in making additional pig runs results when gas pressure builds up behind the pig to an extent that it produces a greater differential pressure than is required to move the pig through the line. This pressure may build up because the pig meets with resistance to movement at a bend or water collecting in front of a pig will produce a head pressure when the pig is going up hill. When whatever is causing the resistance is removed, or the pig clears the top of the hill, the pressure that has built up will cause the pig to travel at a high rate of speed for a considerable distance. During this fast run the pig may be damaged to an extent that it will become ineffective as a "squeegee," or it may rupture the pipe at a short radius bend.

If the nature of the test section is such that there is a likelihood of a pig encountering an obstruction, consideration should be given to pressurizing the test section with gas before the second or subsequent pig runs are made so that if the pig "hangs up" during the run at a bend or some obstruction and breaks free when the differential pressure becomes high, the gas ahead of the pig will act as a cushion to reduce its speed and the distance it travels.

The equations below can be used to calculate the distance a pig can be expected to run under excessive pressure differential.

$$\Delta d = d\left(\frac{P_1 D}{P(D-d) + P_1 d} - 1\right) \quad (1)$$

where:

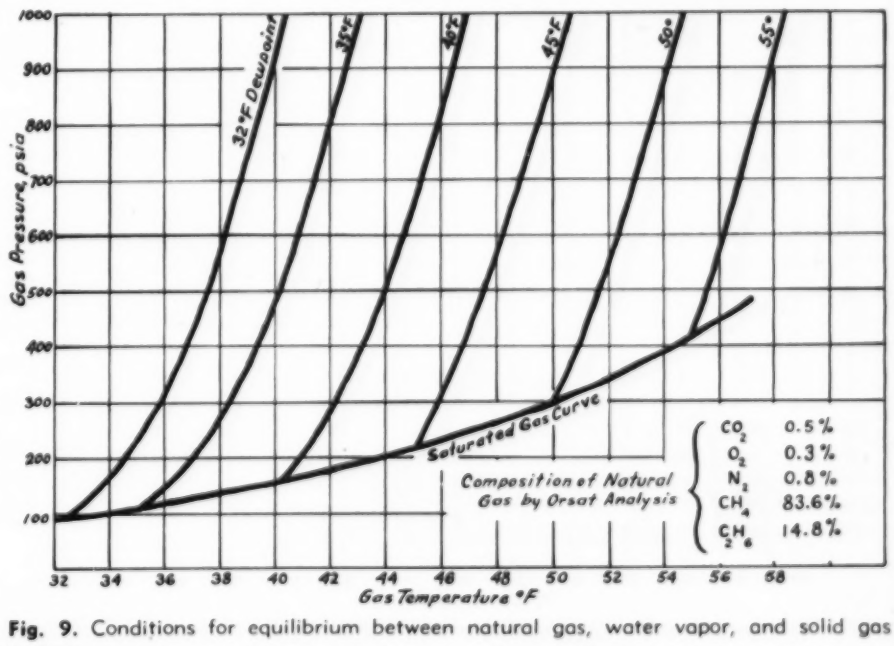

Fig. 9. Conditions for equilibrium between natural gas, water vapor, and solid gas hydrate.

Δd = distance pig travels after clearing obstruction before pressure is equalized.

d = distance of obstruction from upstream end of section.

P_1 = pressure of gas behind pig at time it breaks free of obstruction.

D = length of test section.

P = initial pressure of gas in section when pig is launched.

The distance, d, for the pig travel to be a maximum can be obtained by differentiating Δd with respect to d and equating the resulting expression to zero and solving for d. In this case,

$$d_{(\text{Max. } \Delta d)} = D \frac{(\sqrt{PP_1} - P)}{(P_1 - P)} \quad (2)$$

In the above equations it is assumed that no differential pressure across the pig is required to keep it in motion after it breaks free from the obstruction; and therefore the calculated distance that the pig would travel is greater than would actually be the case since a differential pressure is required to move the pig. A close approximation of the actual distance the pig will travel can be calculated by subtracting from the pressure required to break the pig free of the obstruction, the differential pressure required to keep the pig in motion and substituting this value in equation (1) for P_1.

Putting this method of calculation to use on a 10-mile long test section with a gas pressure of 200 psi where a 15-psi pressure differential is required to free a pig from an obstruction and a 5-psi differential pressure is required to move the pig, it is found that the pig would travel the greatest distance after breaking free from an obstruction if the obstruction was five miles downstream. In this example the pig would travel a maximum of ⅛ mile after breaking free. If the gas pressure in the line was 50 psi, a 15-psi differential pressure was required to free the pig and a 5-psi differential required to keep it in motion the pig would travel the greatest distance if the obstruction was 4.8 miles downstream and the pig would travel a maximum of ½ mile, or four times as far as in the first example, after breaking free.

Pressurizing the line before making additional pig runs will, of course, increase the amount of gas wasted and the overall cost of the hydrostatic test. For example, if a 24-in. pipeline is pressurized to 200 psi before running a pig, the cost per foot of pipe, at $.20 per Mcf for gas, would be $.0085 per pig run or $.0255 per foot of pipe for three pig runs. However, pressurizing the line with gas does not appear warranted if the test section does not contain places where the pig could potentially become stuck.

Avoiding hydrate line blockages

If favorable conditions exist as mentioned previously for displacing the water with one pig run after hydrostatic testing, it has been the experience of several companies that the water left in the pipe is not sufficient to cause operating difficulties due to line blockage by hydrate formation. Even if line, subsequent to a hydrostatic test, is operated at a pressure and ground temperature at which hydrates will form, the amount of hydrate if formed from the residual water in the line is not enough to seriously restrict the flow of gas providing, of course, the gas is sufficiently dehydrated that it does not supply additional water to further increase the quantity of hydrate.

Under favorable conditions the maximum amount of water which is left in a test section after a water displacement

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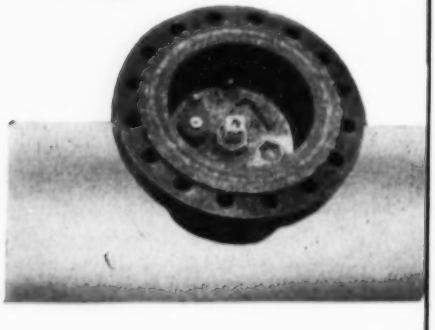

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TORONTO . . . BUENOS AIRES . . . DURBAN, NATAL, SOUTH AFRICA

pig run is about 0.02 lb per sq ft of pipe wall area. Ninety-five percent of this water is in excess of that barely required to dampen the pipe wall. If it is assumed, which is unlikely, that all of this excess water from a mile of 24-in. pipe is concentrated at one spot, it would only fill a 3.5-ft length of pipe. It, therefore, appears reasonable to assume that the water which is left in a test section after the water is displaced following a hydrostatic test would be quite evenly distributed throughout the test section, and the most water left in any one spot would be only a shallow puddle. Of course, enough water to block a line might collect at a low spot on either side of a rapidly ascending pipeline, but in this case the water could be conveniently syphoned off. With only shallow puddles of water in the line it is doubtful whether there would be enough agitation of the water by gas to form hydrates even under favorable conditions of temperature and pressure. Experimentally it has been shown that violent agitation of water and gas are required to obtain hydrate formation.*

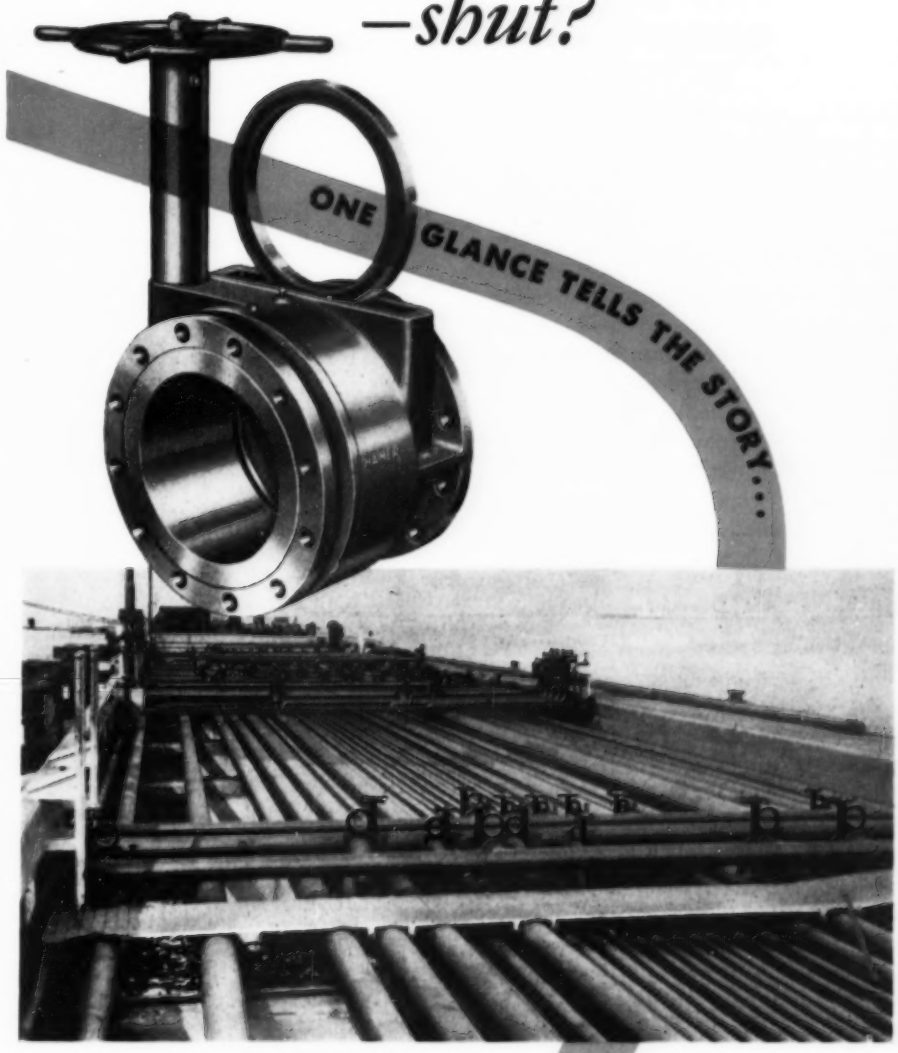
Fig. 9 shows the conditions for equilibrium between natural gas, water vapor, and solid gas hydrate for a California natural gas. The curves were drawn using data on the water vapor pressure of a gas hydrate as a basis;* the curves give the temperature and pressure of a gas of given dew-point to be in equilibrium with a gas hydrate. Starting at the point on the saturated gas curve where the gas dew-point and gas temperature are the same, equilibrium exists between natural gas, water vapor, liquid water, and gas hydrate. As the gas pressure and temperature are increased along the curve of constant dew-point, an equilibrium then exists only between natural gas, water vapor, and hydrate. For conditions to the left of this curve some water in the gas phase would react to form more hydrate and for conditions to the right the hydrate phase would disappear.

The practical significance of the above relation is that even if a gas is slightly undersaturated any hydrate present in the line would not necessarily evaporate; in fact, more hydrate might actually add to it by the reaction of some of the water vapor in the gas phase with the hydrocarbons present. Therefore, to avoid this condition the gas dew-point should be sufficiently

*See paper on the "Lowering of the Decomposition Temperature and Pressure of Natural Gas Hydrates by Solutes in Aqueous Solution" by J. S. Powell, Pacific Coast Gas Assn., Volume 30, Page 52-56.

Lines open?

—shut?



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low at the gas operating pressure and temperature so that the pressure and temperature are to the right of the curve for this dew-point.

It could be argued that even though the gas is sufficiently dehydrated it would become saturated with the free water left from the hydrostatic test ahead of a place where hydrates were located and then additional hydrate would form to eventually cause a blockage. It is possible that more hydrate might form in this case until the water was dried up. However, it is possible that not enough to be significant would be formed since only the small amount of water in the gas from the point of saturation to the hydrate equilibrium dew-point is available and then only a fraction of the total flow of gas would come in contact with the surface of the hydrate. It would only be from this surface gas that hydrate could form, if at all, since it would require the intimate presence of hydrate to promote the reaction.

Although hydrates may not cause difficulty in the mainline after hydrostatic testing, the gas passing through the line will pick up water and may become saturated until all of the water has evaporated. Because of the cooling action at offtake pressure regulators, water may condense from the gas and form hydrates, sometimes resulting in the blockage of the offtake line. To prevent such trouble provision should be made to heat the regulators or to inject methyl alcohol when a free-up occurs. Heating offtake regulators is a common practice not necessarily as the result of hydrostatic testing since frequently in cold weather hydrates will form at regulators even if the gas is undersaturated at the mainline temperature.

Sometimes, although very infrequently, if the proper procedures are followed, hydrate freeze-ups may occur in a pipeline after hydrostatic testing. This may be owing to enough residual water draining to a low spot in a line to form a hydrate plug. Where the profile of the line indicates the possibility of such an occurrence, as mentioned previously, a syphon tap should be put in at the low spot to drain off water and forestall trouble. However, if a freeze-up does occur, it can be removed by injecting methyl alcohol into the line at a point where it will flow down to the place where the plug is. For large pipelines, 1 or 2 bbl of alcohol is usually sufficient to remove a plug.

The authors wish to acknowledge the assistance of M. J. Binckley of Southern California Gas Co.

Pipeline Communications and Electronics

By FRANK CHAPMAN

The future of unattended gas booster stations

THE use of gas-driven centrifugal booster compressors on gas transmission lines during the past few years, coupled with the expanded use and proven dependability of microwave radio communication and control systems, has brought under consideration the remote, unattended operation of these facilities. With but one or two exceptions at the present time, however, the unattended operation of transmission line compressors is relegated to the indefinite future by gas operating people because of certain particular requirements of the industry and its established mode of operation.

Sunray first application

Pipeline pumping stations operating with varying degrees of on-the-spot attention have been in use on oil transmission lines for several years. Sunray Pipe Line Co.'s system in Oklahoma was the first application of microwave radio to this kind of remote controlled operation. A more recent installation is that of the Plantation Pipe Line system for operating four unattended pumping stations on its line from Bremen, Ga., to Knoxville, Tenn. Two of the stations are controlled remotely over microwave circuits, and the other two are controlled over leased telephone circuits. All four, however, are fairly small, single-unit stations.

In the Plantation installation, a complete set of standby microwave equipment is provided at each station with automatic sensing and switch-over equipment to cause a transfer of facilities to the auxiliary unit in case of trouble in the normal unit. A 5-kw, 1200-rpm diesel-driven engine-generator unit, with automatic starting and transfer provisions, installed at each station insures against outage due to failure of the power line supply. The generator sets are started daily by a separate remote control system over the microwave maintenance channel.

In the gas industry, the use of microwave radio circuits for voice and teletypewriter communication, telemetering, and the remote control of valves has been established practice for the past several years. As a result of this experience the reliability of the system has been solidly established. The use of design techniques for dependability contribute to system security, as is exemplified in the Motorola "Vibracode" system of supervisory control, which employs a check-back to indicate the position of the apparatus to be controlled before an operation can be initiated. Reliability of equipment is further enhanced through design provisions that will indicate abnormal operation of the supervisory system itself as well as the equipment under control. Each hour that remote supervisory operation is in use leads to more dependability and brings complete remote control more nearly within the range of the equipment.

Ideal candidate

The automatic starting and shutdown provisions that are built into the modern gas turbine-driven centrifugal compressor make it an ideal candidate for remote, unattended control. With its time relay starting and stopping sequence the equipment is designed in such a way that an absentee operator can control the unit as easily as an operator at the control board in the station. Operating condition of the compressor can be observed by a remote operator equally as well as by an operator in actual attendance.

The automatic valve sequence control that has been widely applied in modern booster station design is also applicable to remote control over microwave circuits. The station can be

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placed on or taken off the line automatically by a single control. United Gas Corp.'s Napoleonville booster station is an example of a station that is completely controlled from a remote location. In this instance EIM controls are used to remotely operate the station piping.

Two additional considerations make the booster station adaptable to remote operation. By the nature of its design in most instances the station may be taken off the line in the case of an emergency without substantially impairing the flow capacity of the line. Also, by locating the booster station in an isolated place and separating it from the pipeline by some distance, as is the usual practice, any serious trouble at the station will not carry over to either the line or adjacent property. The latter practice is generally only applicable to lines through sparsely populated areas.

However, the unattended operation of an installation as large as a booster station is still not considered advisable in most instances. Because of their smaller size, unattended stations in distribution or gathering systems are considered to be more nearly a present-day reality. This kind of station is similar in size to the average remote oil pipeline pumping station. The philosophy is to not permit the unattended operation of a station such as the average booster station of 5000 hp and above.

An unattended station means a full staff for operating purposes. Good safety practice does not permit operation of a station by a single person, and 24-hour operation demands a large enough staff for time off and vacations.

Numerous advantages

The advantages to be found in remotely operating transmission line booster stations are numerous. Actual application, however, awaits the time required for development of the state of the art to a point where satisfactory reliability in terms of gas industry requirements are satisfied.

Communication meetings

The Southwest Research Institute held a one-day symposium on microwave communications in San Antonio, Texas, on Dec. 4. D. B. McKey of RCA, who is chairman of the microwave section of the RETMA, moderated the discussions. A general discussion session was conducted by Dr. W. M. Rust of Humble Oil & Refining Co., chairman of the central committee on radio facilities of the API. Trevor Clark, associate director the Southwest Research Institute, was luncheon speaker. Discussion leaders included Ed Nuttall, United Gas Co.; J. B. Williams of Philco Corp.; Capt. W. C. Ebby of Television Associates; and M. O. Sharpe of Trunkline Gas Co.

Microwave subcommittee

Also on Dec. 4, in San Antonio, the microwave subcommittee of the central committee on radio facilities met to receive a report on the plan to allow portable station operation on microwave networks. The subcommittee has considered the importance of allowing pipeline companies to move around portable radio equipment in field offices on quick notice. The central committee is contemplating a request to the FCC for the use of portable stations in conjunction with petroleum microwave systems in the 2450-2500 m.c. band, the 3500-3700 m.c. band, and the 6425-6575 m.c. band.

With the FCC

FCC has approved the plans for a survey of mobile radio facilities in use in the United States to be conducted by Radio-Electronics-Television Manufacturers Assn. and commission personnel. The RETMA and the commission's staff met during the week of Nov. 23-27 to lay final plans for the survey. The survey is designed to determine the number of mobile units authorized, the number of units in use, the type of equipment in use in the various frequency bands, and the time of operation of mobile transmitters.

Central committee files comment

The central committee on radio facilities filed comments with the commission on Nov. 9, 1953, supporting the proposed rule changes in Docket No. 10709. This proposal would permit assignment of Petroleum Radio Service frequencies to licensees in the Power Radio Service in those cases where the licensee is engaged in the distribution of natural gas directly to consumers and has a substantial requirement to communicate with its gas supplier. It would also amend the rules to permit the assignment of Power Radio Service frequencies to licensees in the Petroleum Radio Service in those cases where the petroleum licensee is not engaged in the operation of a natural gas distribution system. The National Committee for Utilities Radio has also filed "comments" in this docket which generally favor the proposal. The NCUR, however, has requested that the phrase, "such operation shall be limited to communications relating to gas supply and distribution facilities," be amended to read "such operation shall be limited to communications relating to gas supply and distribution and to intercommunication with the natural gas distributor to whom such power radio service frequency or frequencies have been assigned." NCUR has indicated that the wording as proposed might possibly hinder its regional frequency coordination plan.

Recent FCC authorizations

The following authorizations have been issued by the Federal Communications Commission in the Petroleum Radio Service:

1. Texas Gas Transmission Corp., Owensboro, Ky., for two base stations at Carthage, Texas, and Haughton, La., on 48.90 m.c.

2. Tennessee Gas Transmission Co., Houston, Texas, for one fixed control unit at Catlettsburg on 456.55 m.c. and one fixed relay at Prichard on 451.55 m.c.

3. East Tennessee Natural Gas Co., Knoxville, Tenn., for three fixed relay stations at Knoxville and Greeneville on 75.50 m.c. and at Greeneville on 48.58 m.c.

4. Greeley Gas Co., Craig, Colo., for one base station at temporary locations in Colorado on 48.90 m.c.

5. Public Service Co. of North Carolina Inc., Gastonia, N. C., for one base station near Spindale on 48.98 m.c.

6. Petroleum Communications Inc., Lafayette, La., for eight base stations near New Iberia and Lake Charles and at Mermentau, Church Point, Lafayette, Garden City, Gray, and Harvey on 153.17 m.c. Also for 300 mobile units on 153.43 m.c., 43 operational fixed units, 23 in Texas and 890-940 m.c. with two each near New Iberia and Morgan City and at Lacassine, Church Point, and Allemands, each location having one each on 6705 and 6745 m.c., and two each of Lafayette, Mermentau, Garden City, and Gray, each location having one each on 6625 and 6585 m.c., one at Harvey on 6625 m.c., and at Lake Charles on 6585 m.c.

7. El Paso (Texas) Natural Gas Co. for one base station at Best on 48.74 m.c.

8. Hope Natural Gas Co., Pittsburgh, for one fixed control unit near Kent, W. Va., on 456.25 m.c.

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PIPELINE NEWS

Export of Alberta gas to Minneapolis approved

After many months of hearings and conferences between Alberta provincial and Canadian federal authorities, the export of natural gas from Alberta fields to Minneapolis was approved last month. The gas would be delivered to the Minneapolis Gas Co. by Northern Natural Gas Co., Omaha, through its proposed line from the Canadian border.

The compromise agreement between backers of an all-Canadian line and a line to United States was announced by Alberta's premier, E. C. Manning. The announcement paved the way for an early start on construction of a pipeline from Alberta. The line will run 600 miles east to Winnipeg, Manitoba, with a branch from there to a connection with the Northern Natural line to Minneapolis. The mainline will be continued eastward around the North Shore of the Great Lakes to eastern Canada. Premier Manning said it still remains for the companies which applied for permits to export from Alberta to combine their plans and submit them to the government.

Western Pipe Lines Ltd., one of the two firms, had proposed to deliver 170 MMcf to Minneapolis if it won the permit, and has signed a contract with a United States firm. The other company, Trans-Canada Pipe Lines Ltd., had proposed an all-Canada line bypassing the U. S. market.

Oil experts expressed mild surprise at the final decision. The federal board of transport commissioners, which has ultimate control of interprovincial commerce, had expressed strong opposition to United States export, favoring the all-Canada line. However, experts interpreted the compromise solution as an attempt to defray the prohibitive cost of a 2000-mile line.

Darry Franz, editor of the *Daily Oil Bulletin*, voice of the Canadian oil industry, said, "I am pleased export to Minneapolis has been approved. Excluding of the United States market would be a grave error. It would deprive gas producers of the high prices which prevail in the region."

Church Buttes field development booming

"We have only scratched the surface," D. K. Bowen said recently in a report on the development operations in the Church Buttes field of Wyoming, Utah and Colorado. Mr. Bowen is Rock Springs manager of the Mountain Fuel Supply Co., which has launched large-scale prospecting by geologists and seismograph crews in the 50,000-acre Green River basin.

Mr. Bowen estimates gas reserves up to nearly 250 billion cu ft, a 20-year supply, in the field. Church Buttes field is considerably larger than other fields under lease by Mountain Fuel. The greater part of the development drilling has been in the southern portion of the structural area, but the northern portion of the field is now being explored. The first wells in the field were developed in 1945 with production levels at depths ranging from 12,894 to 13,378 ft below the earth's surface.

The new 10-story east wing of the United Gas building in Shreveport was dedicated recently. The wing adds about two-thirds as much floor space as the original building which was completed in 1940. United Gas Corp. president, N. C. McGowen, officiated at the ceremonies. He traced the growth of the company from $25 million in operating revenues in 1930 to $203.8 million for the 12 months ended October 1953. He said the number of employees had increased from 3700 to over 6400 during the same period.

Transco tells plan to expand New York service

While Tennessee Gas Transmission Co. was refiling its application with plans to serve the New York-Philadelphia area, Transcontinental Gas Pipe Line Corp., Houston, made a rebuttal with its announcement of plans to file an expansion plan with the FPC. The program would lift Transco's system capacity from 555 MMcf daily to about 820 MMcf.

Beginning in the fall of 1954, Transco President Tom P. Walker said in the announcement, winter deliveries will be boosted by approximately 135 MMcf per day from storage, while an additional 130 MMcf will become available from the enlarged pipeline on a year-round basis beginning in the fall of 1955.

Construction to be included in the application includes an $80 million addition of 533 miles of 30- and 36-in. looping and additional compressor stations on its 1840-mile Texas-New York line. An arrangement with Texas Eastern Transmission Corp. would enable Transco to store gas in the Oakford reservoir near Pittsburgh. This would increase the company's storage to 12 billion cu ft, adding about 135 MMcf per day to its delivery capacity during the winter months.

"Negotiations are under way for the purchase of sufficient quantities of gas from locations and at prices which will affect our present cost structure the least," Mr. Walker said.

New source of supply to serve North Dakota towns

A new source of gas will supply fuel for heating and cooking in the northern counties of North Dakota in 1954, according to recent reports. The gas will come from oil wells in the Williston basin.

Amerada Petroleum Corp., Tulsa, has signed a contract for sale of gas from its wells in the Tioga and Beaver Lodge pool areas of North Dakota. A new firm, the North Dakota Natural Gas Transmission Co., St. Paul, plans to construct a 500-mile pipeline eastward from Tioga to serve such towns and cities as Minot, Fessenden and Grand Forks. The new company is headed by Emmet Butler, president; F. J. McArthur, secretary-treasurer; and Jay A. Anderson, executive vice president.

Construction on the $12.5 million line is scheduled to begin this spring, pending North Dakota Public Service Commission approval. The first gas carried will come from a new processing plant now being built by Signal Oil & Gas Co. at Tioga. The plant will have a capacity of 40 MMcf of gas per day and will extract 150,000 gal. of natural gasoline and other liquid petroleum products and 40 tons of bulk sulfur.

The pipeline will include 78 miles of 12-in. line from Tioga to Minot, 240 miles of 10-in. line from Minot to Fessenden, Tokio

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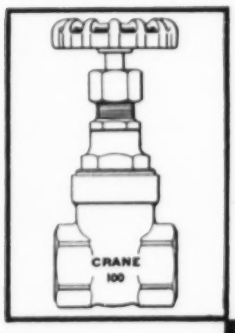
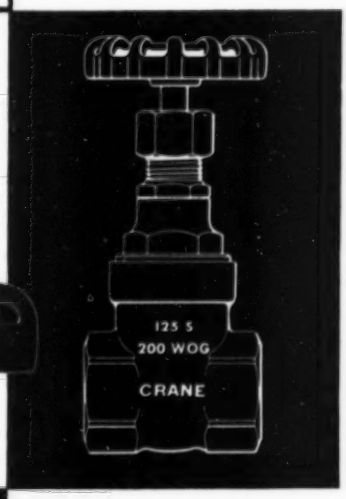


No. 410,
100-Pound



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Latest plans of the Houston Texas Gas & Oil Co. include two huge gas lines—one a 30-in. line to extend from Louisiana to New York. (See November *GAS*, p. 110). The second would run from Lake Charles, La. to Chicago, or from McAllen, Texas, with a lateral from Lake Charles. The lines are expected to cost more than $150 million each.

and Grand Forks, 15 miles of 8-in. from Tokio to Devils Lake, 70 miles of 6-in. from Fessenden to Jamestown, 95 miles of 10-in. from Jamestown to Fargo and 45 miles of 6-in. from Fargo to Wahpeton. Storage facilities will be erected along these routes.

Refusal to review Phillips case affects 2300 producers

The Supreme Court's decision refusing to review an appellate court's ruling, bringing Phillips Petroleum Co. within the purview of the Federal Power Commission, had the natural gas industry in an uproar at year's end.

The practical effect of the decision is to bring all independent producers under FPC rules, and the difficulty of separating non-gas activities from those concerned solely with producing and gathering the gas had the independents worried as to the effect regulation might have on these other phases of their business.

FPC, too, expressed consternation over the decision, inasmuch as the commission itself had originally decided it did not have jurisdiction over Phillips' operations. FPC is said to be ill-equipped, from a standpoint of manpower, to extend its powers over such a large segment of the producing industry. As many as 2300 producers are expected to be involved.

As soon as the decision was announced, Congressmen from the Southwest and Southern producing states declared their intentions to renew the fight to secure passage of a Kerr-type bill in the new legislative session.

The high court's action had its origins in prolonged hearings held almost three years ago by FPC to determine whether (1) it had jurisdiction under the Natural Gas Act over Phillips' sales to natural gas transmission companies, and (2) if so, whether Phillips' rates for gas sold were unreasonable. FPC decided it had no right to dictate rates, so the second problem was never explored further. Now it must be.

Last May the circuit court, acting on petitions presented by municipalities and state regulatory bodies in consuming areas, reviewed the FPC decision and found it to be in error. The plea for review by the Supreme Court was pressed by Phillips, the FPC staff, and producing states.

Plan to serve New York refiled by Tennessee Gas

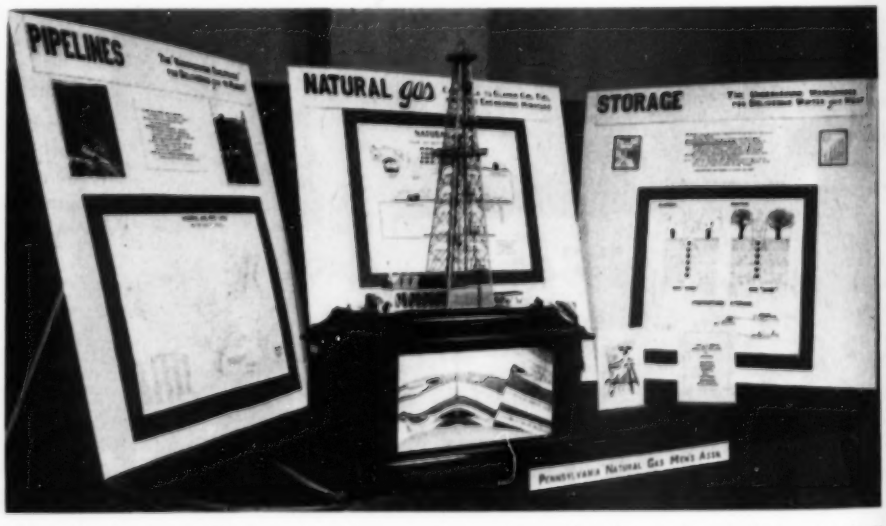
Tennessee Gas Transmission Co., Houston, has withdrawn and refiled its proposal to build a 243-mile, 24-in. line from Hebron, Pa., storage field to New Jersey and New York with a terminus at Greenwich, Conn. (See December *GAS*, page 118.) A change in allocation, whereby ConEd's (New York) daily purchase would be increased from the 10 MMcf originally scheduled to 30 MMcf, necessitated a revision in the application and supporting exhibits.

The new application renews a Tennessee Gas offer to provide new storage service on an option basis to its new customers in the New York area. The application as refiled also renews the company's request to acquire an interest in and develop the Harrison field for storage.

The proposed construction will give Tennessee Gas an unallocated capacity in the Hebron-Greenwich line of 36 MMcf daily. The company plans to sell this in the New York rate zone and some or all may be sold to companies in the Philadelphia area.

Gulf Interstate line work passes half-way mark

Construction of the 860-mile Gulf Interstate Gas Co. line (docket G-2058) is proceeding "on schedule," it was announced recently by George S. Young, president of the Columbia Gas System Inc., which will be served by the Gulf Interstate line. The halfway mark of construction was passed early last month as the 3000 pipeliners, many working more than 12 hours a day, completed the 500th mile of the 30-in. line. The system will include five 8000-hp com-

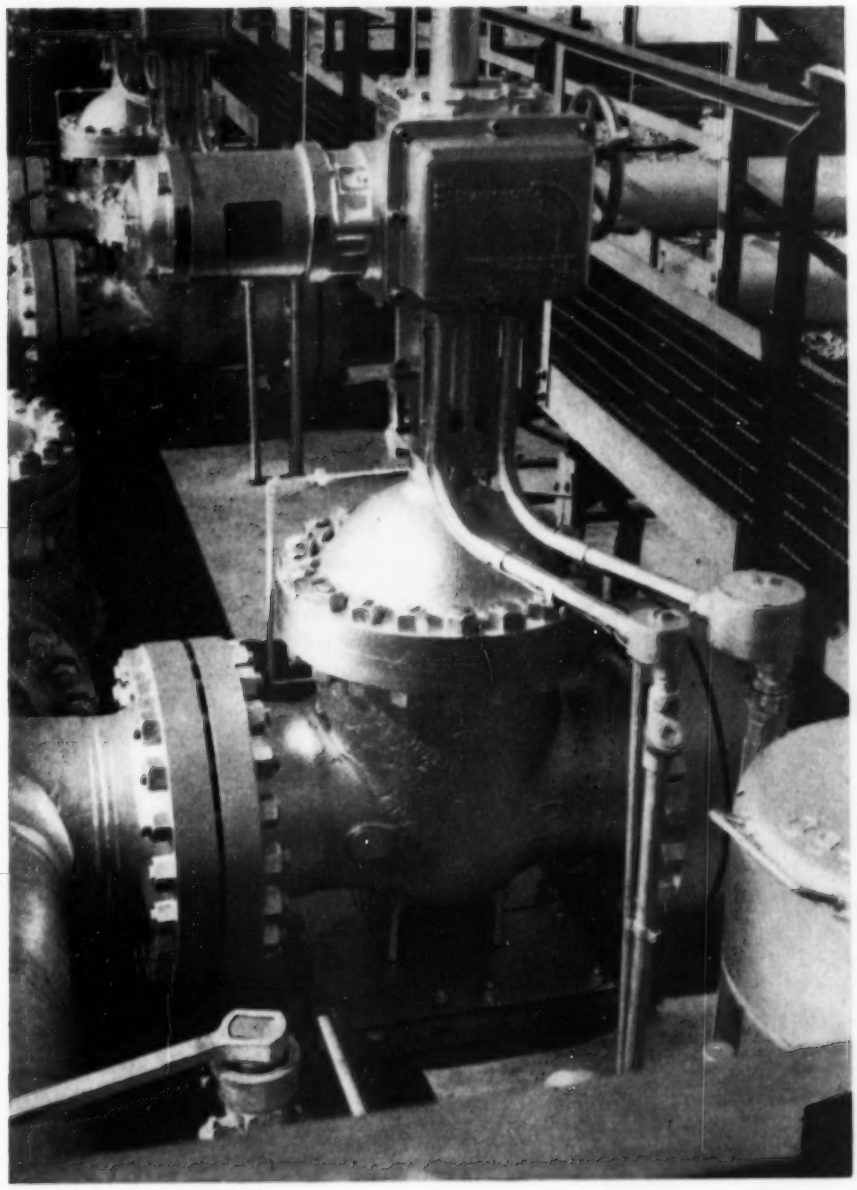


The role of gas pipelines and underground storage as the "two engineering miracles" which have transformed natural gas from "Cinderella to Glamour Girl" fuel is the theme of a promotional display developed by the Pennsylvania Natural Gas Men's Assn. for the first annual "Engineers for Pittsburgh's Future" show.

DARLING VALVES

How they cut down time in pipe line service . . .

with DARLING *Revolving Disc* GATE VALVES



Electrically operated 16" x 12" x 16" venturi-type Darling fully revolving double disc parallel seat *gate valves on a main line station.*

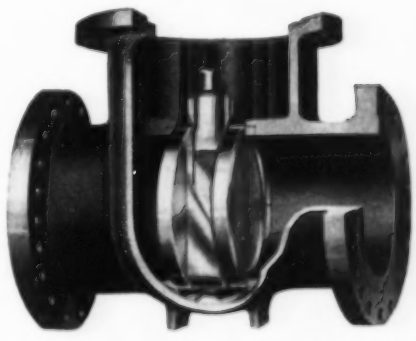
"What a difference!" . . . That's an expression often heard after Darling *fully revolving double disc parallel seat* gate valves go on the job.

In applications like this, these unique Darling valves show off their advantages well.

For example, Darling revolving disc gate valves successfully compensate for valve body distortion . . . they close tight every time! In addition, wear on discs and seats is *uniform.* These important parts just naturally last longer. After years of trouble-free operation should it become necessary to service the valves, the four working parts can be replaced on the spot . . . without removing the valves from the line.

GET ALL THE FACTS

Darling valve users are our best salesmen . . . we invite you to check with them. In the meantime let us send you a descriptive bulletin giving cost-saving facts. Just outline your specific service needs. State whether you are interested in main line, gathering, tank farm or other gas and oil line service. Darling valves can save you a lot of costly, time-wasting valve trouble in the future.



Cutaway showing complete simplicity of the Darling fully revolving double disc parallel seat *cast steel gate valve. Notice the four working parts . . . two interchangeable, no-pocket discs and two husky wedges. Maintenance is easy, assembly foolproof.*

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Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

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A pipe stringing crew of Western Pipeline Constructors Inc. unloads lengths of 30-in. pipe on a 73-mile section of line between Ashfork and Flagstaff, Ariz. The company has contracted to build 164 miles of line in this area for the El Paso Natural Gas Co. The section is expected to be completed in March.

pressor stations, 18 radio stations and 100 mobile transmitting and receiving units in trucks and cars.

The $129 million project is expected to be completed by next November. When in operation it will deliver up to 375 MMcf of gas daily to the United Fuel Gas Co., Charleston, W. Va., where the gas will become part of the pooled supply of the Columbia Gas System.

Ark-La plans expansion to meet increased demands

The Arkansas Louisiana Gas Co., Shreveport, has asked FPC to approve construction of about 107 miles of line and a new 10,500-hp compressor station on its transmission system in Arkansas, Louisiana and Texas. Cost of the project will be about $9,245,166.

The company said the new facilities are necessary to enable it to keep abreast of increasing requirements of customers of its present system. The 107 miles of line would be constructed in nine different sections on its system. Sections would range from ½ to 24 miles and would vary from 8⅝-in. to 24-in. pipe.

Completion of proposed construction is set for 1955. The new facilities will enable the company to make peak day deliveries of nearly 816 MMcf in 1956.

Columbia companies plan 26-in. line additions

The Atlantic Seaboard Corp. and Virginia Gas Transmission Corp., Charleston, W. Va., have made a joint application (docket G-2286) for construction of 116.6 miles of 26-in. transmission line and 4400 hp in compressor facilities along the route of their existing system in West Virginia, Virginia, and Maryland. The proposed line would be in five separate sections paralleling portions of the existing line. Compression would be installed at two existing stations and in one new compressor station. Total cost of the project is estimated at $14,634,300.

The application states that the present authorized capacity of the system is 470.3 MMcf per day and that a deficiency of 86.4 MMcf is expected in the winter of 1954-55. The new facilities would allow transmission of the additional volumes.

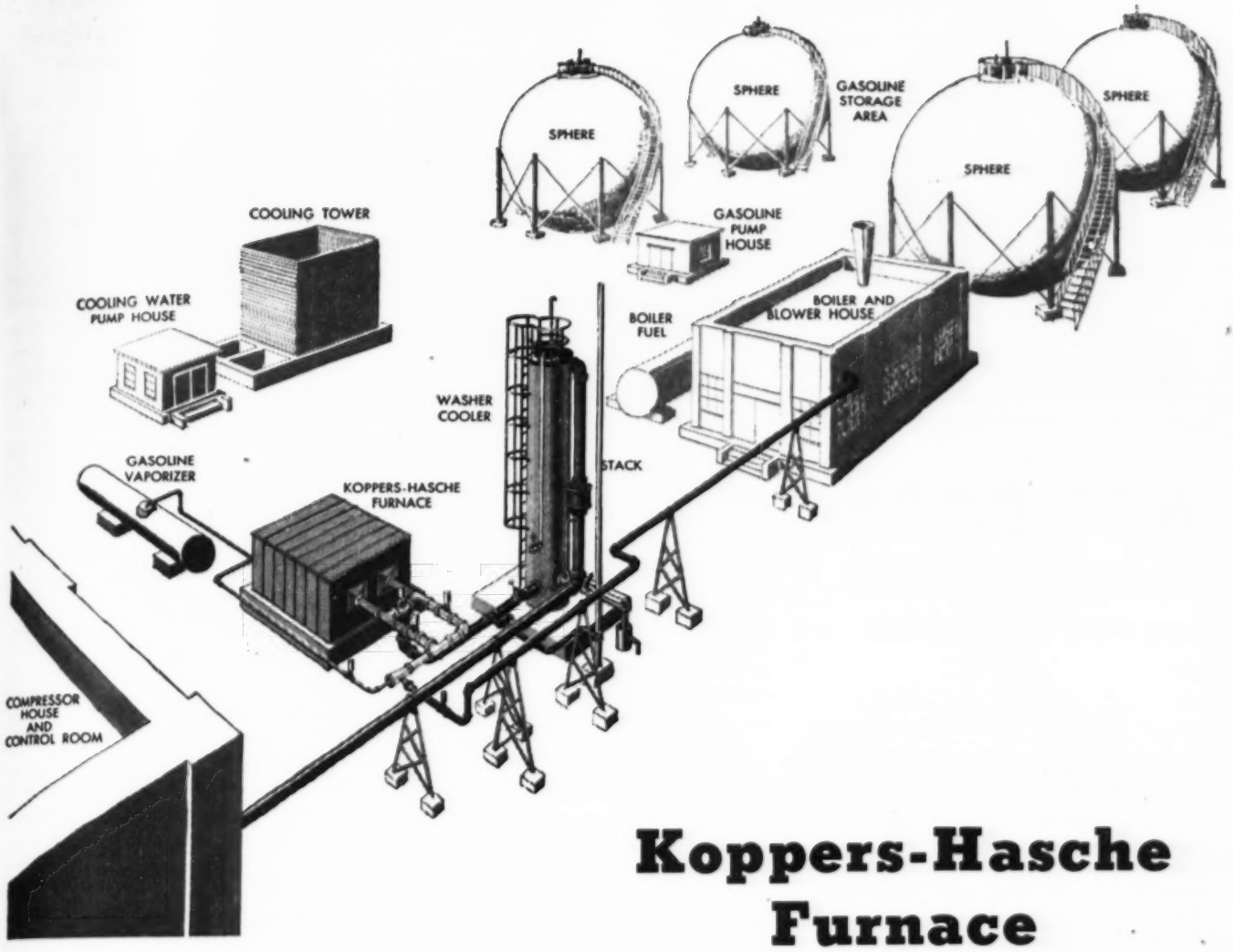
The companies, both subsidiaries of the Columbia System, each own and operate sections of a continuous 420-mile line from Boldman, Ky., to the Maryland-Pennsylvania state line, and a 262-mile line from Clendenin, W. Va., to a point near Rockville, Md.

Saskatchewan gas property development increasing

Activity in natural gas development in the Province of Saskatchewan has been accelerated in recent months, according to a recent report on resources and industry. In some respects this is a result of a new governmental decision to begin construction of a provincial gas grid system and the assurance that exports will be allowed after home requirements are assured.

Current permits cover 34 million acres, and an additional 1 million acres are under lease. This includes 281 permits to 58 operators and 740 leases held by 46 companies. Development expenditures for 1952 were $31 million and are expected to reach $55 million for 1953. This included drilling of 496 wells, of which 235 were wildcats, in 1952. Exploration has included magnetometer, gravitometer, and seismic surveys, which have covered 28.5 million acres.

At the peak of 1952 activities 53 geophysical exploration crews were working in the province. Drilling was also in full swing with a total of 535 licenses issued for deep



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SOME PRINCIPAL FEATURES

Low Investment Cost

Extreme simplicity of process makes initial investment low compared to other types of production facilities. Savings are effected not only on furnace cost, but also on auxiliaries. Complete plant is compact, requiring relatively little ground space. Most of the equipment can be installed outdoors, saving cost of protective housing.

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Units are entirely automatic in operation, requiring minimum of operating labor and supervision. Few moving parts, thus reducing maintenance.

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You are not limited to the use of propane with a Hasche Plant. Natural gasoline, readily available both winter and summer, is an ideal fuel to augment your natural gas supply.

THE Koppers-Hasche Reforming Process and Furnace are the result of 20 years of intensive experimental and development work. The Hasche Furnace is *unique in design,* being a thermal reforming process in which no free lampblack or carbon is produced. Gas is produced by passing a mixture of air and hydrocarbon feed stock continuously through a regenerative furnace.

The Hasche Furnace is invaluable in helping utility companies meet peak loads. Also, for industrial plants which use natural gas, as well as for utilities which distribute natural gas, this furnace is always ready to pinch hit in the event of temporary failure of the natural gas supply.

For further information about the Koppers-Hasche Furnace, phone, write or wire.

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HOT DOPE

Straight from the Kettle on *PIPE PROTECTION*

★

By Boyd Mayes

• Got to talking the other day with a fellow who'd let a contract for coating and wrapping a few miles of gathering line on which we didn't get a bid. "Thought you wouldn't be interested in peanuts like that," he told us. "Thought you were too big to monkey around with anything but big-inch pipe that ran into a lot of mileage."

That one was hard to swallow but it gave us a chance to explain our policy that's going into its twenty-seventh year without change, where service to customers is concerned.

"The biggest thing about our outfit," we told him, "is our customers. And it's nice for our customers that *we're big enough to handle little jobs.* We've handled many a job of cleaning, coating and wrapping 2" hauled in racked on a pick-up when we had to straighten out kinks and overhaul ends before we could even work with it. We're pipe conditioning people, whether it's the biggest or the smallest job ever let. We certainly don't want to be the biggest outfit in the world, but we are mighty glad we're big enough to handle little service jobs without bellyaching about it. We're extremely proud of the fact we've coated and wrapped enough pipe to circle the globe nearly three times."

MAYES BROS.

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drilling and 744 for structural test hole drilling.

There are now 13 officially classified fields and six pools with 22 potential producing areas. Based on the analyses of five partially developed areas, the report continues, reserves are estimated at 1 trillion cu ft, considered to be sufficient for foreseeable demands for 20 years. Most of these reserves have been determined within the past year.

Texas Eastern lines to be extended to new supplies

The FPC has issued a certificate (docket G-2208) to Texas Eastern Transmission Corp., Shreveport, giving it final authority to construct about 17 miles of pipeline and a 4400-hp compressor station in Shelby county, Texas. The new facilities, already well under way, will enable the company to transport additional quantities of gas into its main transmission system.

The project estimated to cost $1,981,900, includes a 4.3-mile line from the Englehart field in Colorado county, Texas, to a connection with the firm's Provident City, Texas, to Castor, La., line. An 11.5-mile line will run from North Big Hill field in Jefferson county, Texas, to a connection with the Provident City-Beaumont line. The compressor station will be located on the Provident City-Castor line.

The additional gas to be picked up in the Provident City area will replace, in part, certain diminishing supplies which have been available in the Hico-Knowles and other Louisiana areas north of Castor.

Two annual rate increases granted; four suspended

Top rate news of the month is the FPC settlement granting Hope Natural Gas Co. of Clarksburg, W. Va., a $3,511,308 per year increase. Another West Virginia company, United Fuel Gas Co., will be allowed an annual increase of about $1,340,000. In an order concurrent with the increase granted, a proposed increase was suspended for Hope Natural Gas Co. amounting to $3,676,000.

Other proposed increases suspended by the FPC include approximately a $7,210,000 increment for Natural Gas Pipeline Co. of America, Chicago; a $5,306,000 increase proposed by New York State Natural Gas Corp., Pittsburgh; and an increase for East Tennessee Natural Gas Co., Knoxville, for $502,000.

By FPC order, annual increases of $1,342,927 for Manufacturers Light & Heat Co. and $236,588 for Home Gas Co. become effective under bond and subject to refund. Also ordered is the reconvening of hearings involving joint increases of $3 million and $4,318,000 which are now effective under bond for Atlantic Seaboard Corp. and Virginia Gas Transmission Corp., both of Charleston, W. Va.

Kansas minimum wellhead price raised in Hugoton

The minimum wellhead price for gas in the Kansas area of the Hugoton field was increased by the state corporation commission from 8 to 11 cents per Mcf in a ruling early last month. The higher rate, allowed as a conservation measure, was effective Jan. 1.

Measurement of gas will be on a pressure basis of 14.65 psi, which the commission established in an order effective July 1. This order is before the Seward county district court for review at the request of protesting pipeline companies. State officials said they did not know how many present contracts will be affected by the new minimum price, but cited specifically the 8.4 cents paid Stanolind Oil & Gas Co., one of the biggest producers in the field.

Certificate changes okayed for southwest operations

FPC has authorized changes (see November *GAS*, page 106) in construction and operation of pipeline projects being carried out by El Paso Natural Gas Co., Northern Natural Gas Co. and Permian Basin Pipeline Co., Omaha. The authorization includes changes in the arrangement whereby gas will be delivered by Permian to Northern through El Paso's facilities.

It also authorized Permian to construct 67 miles of 20-in. pipe in lieu of 70 miles of 16-in. as previously authorized. Construction of the shorter but larger diameter line will increase the line capacity from 100 MMcf per day to 187 MMcf and reduce ultimate costs by eliminating the necessity of a compressor station installation.

United to increase rate of injection for storage

The United Fuel Gas Co., Charleston, W. Va., has applied (docket G-2285) for authority to construct a 4400-hp compressor station at its gas storage pool X-59 in Jackson county, W. Va. Estimated cost of the station, needed to increase injection rates, is $2,240,000.

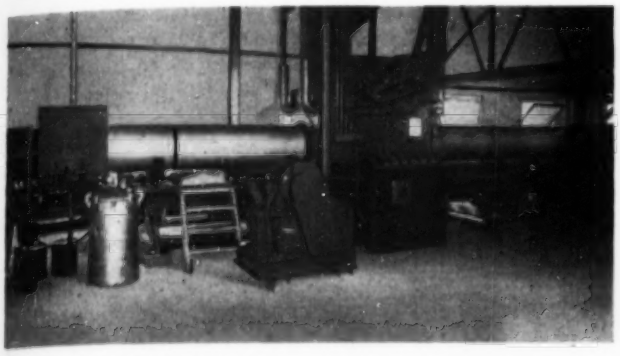
United, a Columbia Gas System subsidiary, declared that present schedules call for storage of 10,720 MMcf of gas in the pool during the summer of 1955 with 6 billion cu ft to be injected during July and August. This will require injection rates up to about 125 MMcf per day. The new station will help the company to attain this rate of injection.

Increase in line capacity planned by Manufacturers

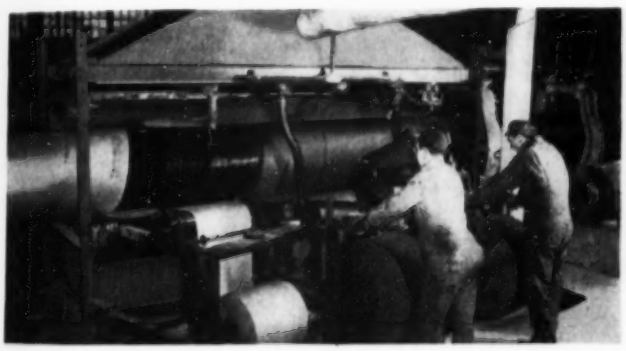
Columbia Gas System subsidiary, Manufacturers Light & Heat Co., Pittsburgh, has filed application (docket G-2289) for construction of 75½ miles of 10-, 12-, 24-, and

HOT CAUSTIC DIP removes all cutting oil and grease. Pipe is then rinsed in clear, hot water and dried in warming room. Throughout Hill, Hubbell process, pipe is kept at 80-90° to prevent moisture condensation.

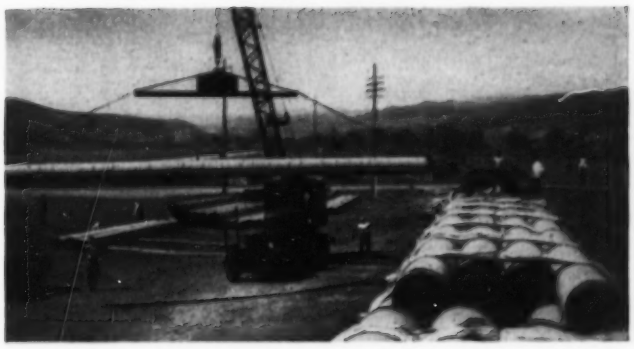
Why HILL, HUBBELL Factory-Coated Pipe Lasts Longer



ROTO GRIT BLAST removes all mill scale and rust, cleans pipe to bare, bright metal, provides a slight "tooth" to hold coatings in positive bond. Priming coat is applied immediately after Roto Grit Blast.



SECRET of Hill, Hubbell superiority is applying enamel in multiple 1/32" coats instead of one thick coat—pipe protection insurance that pays off in the field. Then pipe is tightly wrapped under even tension by special machines.



ELECTRONIC holiday detectors inspect every length of pipe before it leaves a Hill, Hubbell plant—further insurance that coatings have dielectric strength to resist electrochemical corrosion underground.

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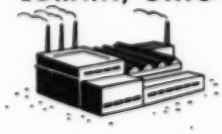
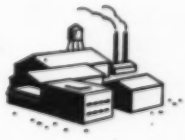


HAMMOND, IND.
Chicago Switching Zone (in transit privileges)



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26-in. replacement lines and 4180 hp in compressor facilities—3300 hp in a new station and 880 hp additional at an existing station.

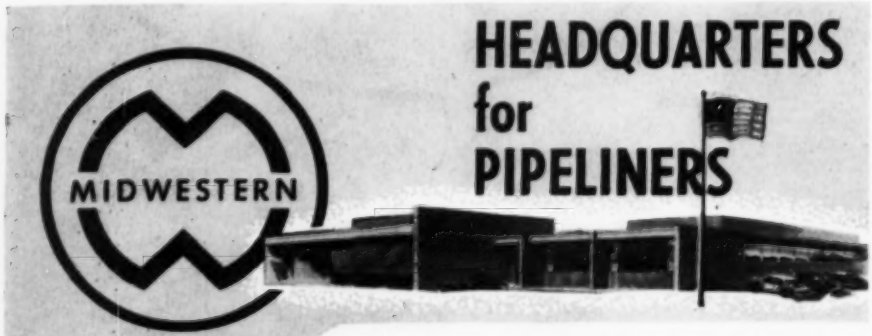
Manufacturers plans to construct the facilities to enable it to handle additional volume of gas expected to be available beginning with the winter of 1954-55 from the pooled gas supply of the Columbia system. No new markets would be served. The increased volumes will be used to meet the increased demands of existing markets. Total cost of the proposed facilities is $5,792,550.

The project includes about 27 miles of 12-in. loop line, 14.4 miles of 10-in., 18.5 miles of 20-in., 5.6 miles of 24-in., 10.22 miles of 26-in. replacement lines. Facilities would be located in Washington, Allegheny, Chester, Lancaster, and Adams counties, Pa. and Marshall county, W. Va.

Ohio Fuel asks FPC okay on new construction plan

Ohio Fuel Gas Co., Columbus, has asked FPC to authorize its plan (docket G-2288) to construct about 63 miles of 16- and 20-in. line at a total estimated cost of $2,668,000.

The Columbia Gas System subsidiary said the facilities will parallel or replace sections of existing lines to protect service to existing markets and provide capacity for adequate service during the 1954-55 winter. The application said the facilities will enable Ohio Fuel to transport additional gas to be available in the fall of 1954 from the general pooled supplies of the Columbia System and from underground storage areas.



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OUTER WRAP — An all-glass outer wrap with less than 1% water absorption rate. High porosity reduces holidays. Perfect for use in double-coat-double-wrap operations.

KAPCO ROCK SHIELD — A mastic composition board for protecting pipe and coating in rocky areas. Drastically reduces dirt padding. Offered in various thicknesses.

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GLASFAB — A flexible, non-irritating glass fabric handwrap. Compatible with both hot and cold bitumens. Excellent for repair work on pipe and for coating tank bottoms.

MAGNESIUM ANODES — For positive corrosion protection against soil acids, stray underground currents. Anodes neutralize electrochemical corrosion.

PROTECTO WRAP — A plasticized coal-tar enamel impregnated into and around a woven glass fabric base. Application is fast and easy by merely "flashing" with a torch.

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Notes

Home Gas Co., a Pittsburgh group subsidiary of the Columbia Gas System, has asked authorization (docket G-2287) of about 50 miles of gas transmission line in Broome, Tioga and Delaware counties, N. Y. The application said the facilities were needed to handle additional volumes of gas which are to become available from the pooled supply of the Columbia system, beginning with the 1954-55 winter. Estimated cost of the facilities is $2,160,500. The project would include 24.3 miles of 12-in. line from Maine to Tioga, and 25.4 miles of 12-in. line from Deposit to Port Dickinson.

A decision of FPC examiner Francis L. Hall has become effective directing Trunkline Gas Co., Houston, to supply a maximum of 2 MMcf of gas per day to Central Illinois Public Service Co., Springfield. Trunkline will be required to establish a connection with Central Illinois' system near Neoga, Ill., at an estimated cost of $10,000. The gas will help Central meet requirements in the Mattoon, Ill., market area.

Colorado Interstate Gas Co., Colorado Springs, has been directed by an order of FPC to supply a maximum of 500 MMcf of natural gas to Kansas-Colorado Utilities Inc., Lamar, Colo. The gas is to be delivered at an existing connection between the two companies' systems at McClave, Colo., during the months of May through October. The order was made effective by the commission following an earlier decision by chief presiding examiner Edward B. Marsh on Oct. 5. (See November *GAS*, page 113.)

Presiding Examiner Francis L. Hall, FPC, has filed a decision authorizing Southern Natural Gas Co., Birmingham, to acquire gas pipeline facilities from Atlanta (Ga.) Gas Light Co., and in turn sell other facilities to Atlanta. The exchange will involve a 5800 ft, 10¾-in. tap line from Southern's Macon branch line to Georgia Power Co.'s Plant Arkwright, which it will buy for $13,852, and a tap line of 1452 ft of parallel 10¾-in. lines, which Atlanta will incorporate into its Macon distribution system. Sale price of this line is $9400.

Texas Gas Transmission Corp., Owensboro, Ky., has been granted FPC authorization to increase natural gas deliveries to the city of Linton, Ind., and the Terre Haute (Ind.) Gas Corp. The order permits an increase in maximum daily deliveries to Terre Haute from nearly 9.6 MMcf to more than 12.7 MMcf and to Linton from 2.1 MMcf to 2.75 MMcf. Deliveries will be made through existing facilities.

Progress Reports

NEW CONSTRUCTION PLANNED

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 107 miles of 8⅝- to 24-in. line in nine sections, and a 10,500-hp compressor station on its system in Arkansas, Louisiana and Texas.

ATLANTIC SEABOARD CORP. and **VIRGINIA GAS TRANSMISSION CORP.,** Charleston, W. Va. Docket G-2286 for 116.6 miles of 26-in. line in five sections paralleling portions of existing system and addition of total of 4400 hp at two existing and one new compressor station.

HOME GAS CO., Pittsburgh. Docket G-2287 for 50 miles of 12-in. line in Broome, Tioga and Delaware counties, N. Y.—24.3 miles from Maine to Tioga and 25.4 miles from Deposit to Port Dickinson.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh. Docket G-2289 for construction of 75½ miles of 10-, 12-, 24-, and 26-in. lines and 4180 hp in compressor facilities in Washington, Allegheny, Chester, Lancaster and Adams counties, Pa., and Marshall county, W. Va.

NORTH DAKOTA NATURAL GAS TRANSMISSION CO., St. Paul. To build about 543 miles of line to serve northern counties of North Dakota.

OHIO FUEL GAS CO., Columbus. Docket G-2288 to construct 63 miles of 16- and 20-in. loop and replacement lines to insure service to existing markets.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. For 533 miles of 30- and 36-in. loop line and additional compressor capacity on its Texas-to-New York line.

UNITED FUEL GAS CO., Charleston, W. Va. Docket G-2285 for construction of a 4400-hp compressor station at its storage pool X-59 in Jackson county, W. Va.

CURRENT CONSTRUCTION

CITIES SERVICE GAS CO., Oklahoma City. Docket G-2149 for 69 miles of line—44 miles 20-in.; 25 miles 16-in.—and 1100-hp addition to Edmond compressor in Oklahoma county. R. H. Fulton & Co. at work. Completion expected Jan. 15.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2120 (1953 program) 49 miles of 20-in. loop line on line near Denver; 30 miles of 12-in. to connect 20-in. with Morton county, Kan., compressor station; 26,900 hp compressor capacity at new and existing stations in Colorado, Oklahoma, Texas, and Kansas. Engineering Construction Co. at work in Kansas. Contracts let to R. H. Fulton & Co. for lines, Fish Engineering Co. and Sterns-Roger on stations. All construction expected to be complete this month.

EL PASO NATURAL GAS CO. Docket G-2106 for total of 1056 miles of line to include about 750 miles of 30-in. and 70 miles of 24-in. mainline with related gathering lines, purification facilities and compressor plants totaling 161,860 hp to carry gas from Permian and San Juan basins. Contractors are Oklahoma Construction Co., R. H. Fulton Co., Western Pipe Construction Inc. and company's own crews. Part of facilities scheduled to be in operation by January 1954, remainder by November 1954.

EQUITABLE GAS CO., Pittsburgh. Docket G-2130 to activate the Logansport storage field in the Big Injun Sand, Marion county, W. Va. Installation of a 1320-hp compressor station in Wetzel county remains to be completed in the spring.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 860 miles of 30-in. line from Rayne, La. to Boyd county, Ky., 229 miles lateral lines and five 8000-hp compressor stations in four states. Mainline contracts let to H. C. Price and Houston Contracting Co. Lateral line contracts let to Anderson Bros., Associated Pipe Line Contractors and Williams Bros. Parkhill Truck Co. hauling pipe. Expect completion Nov. 1, 1954. Over 500 miles of 30-in. line completed. Work under way on 313 miles of gathering lines.

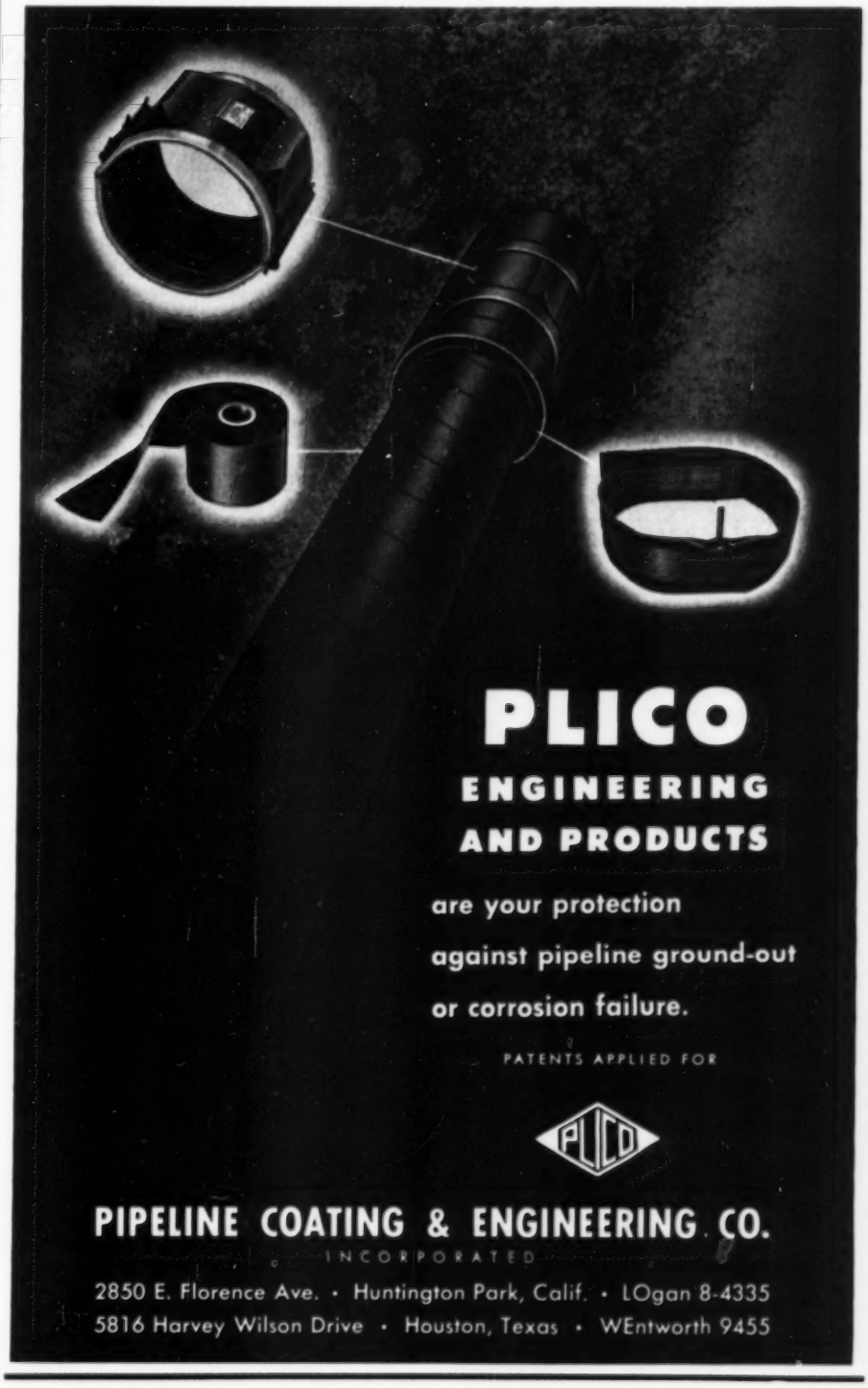
KANSAS-NEBRASKA NATURAL GAS CO. INC., Hastings, Neb. M&R Construction Co. at work on 26 miles of 12-in. line from Ogallala to Big Springs, Neb.; Brodie Construction Co. at work on 32 miles of 4-in. to 8-in. gathering lines in Hugoton field, Kan. Ryan Construction Co. at work on 18 miles of 6-in. line from Palco to Hill City, Kan.

NEVADA NATURAL GAS PIPE LINE CO., Las Vegas. Docket G-1888 for 110 miles of 10-in. line from Topock, Ariz. to Whitney, Nev., serving Las Vegas and Henderson areas. Contract let to R. H. Fulton Co., Lubbock, Texas. Gas to flow Jan. 20.

NORTHERN NATURAL GAS CO., Omaha. Docket G-2009 for a 1.4-mile, 8⅝-in. branch line from its Omaha branch line to a proposed regulating station near La Platte in Sarpy county, Neb. To be completed in January.

PACIFIC GAS & ELECTRIC CO., San Francisco. Docket G-2102 to build about 220 miles of 34-in. mainline loops and 2500 hp in compressor capacity on line from Topock, Ariz. to a point near Milpitas, Calif.; and 6.5 miles of line between Milpitas and Irvington, Calif. Work begun by Engineers Ltd. Pipeline Co. south of Kettleman Hills. Completion of 88-mile Kettleman-Arvin section scheduled for April 1954.

PERMIAN BASIN PIPELINE CO., Omaha. Docket G-1928 for 234 miles of line and 54,880 hp in compressor stations to carry gas from Upton, Midland, and Pecos counties, Texas and Lea county, N. M. to connection with 24-in. El Paso Natural line to Dumas, Texas. R. H. Fulton at work on mainline. Fluor Corp. Ltd., Dresser Engrg. Co. and Sterns-Roger Mfg. Co. on compressors. Compressors totaling 12,080 hp to be



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constructed in 1954. Remainder of project to be completed in January.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.**, Los Angeles. Docket G-2104 to build about 73 miles of 30-in. mainline loops and 5280 hp in additional compressor capacity at Blythe on existing line extending from Blythe to Santa Fe Springs, Calif. Work begun Sept. 15 by River Construction Co. on line; Apex Steel Corp. working on compressor plant; Pacific Pipeline Construction Co. coating pipe. Line to be in operation by Jan. 31, 1954.

TEXAS EASTERN TRANSMISSION CORP., Shreveport. Docket G-2208 for 17 miles of 6- and 8-in. lines to connect with Englehart and Big Hill gas fields; a 4400-hp compressor station in Shelby county, Texas. Work under way. Englehart line completed by Murray & Co.; Big Hill line nearing completion by Geo. W. Fowler Co.; compressor station scheduled for completion in spring by Brown & Root Co.

New Products

For additional information on these products use coupon on p. 63.

14 Ball Bearing Fitting

A new addition to the Emsco ball bearing swivel fitting line is this Type LPR Emsco fitting, specially designed for applications and pressures used with schedule 40 pipe. This fitting is designed for a maximum pressure of 1000 psi at a maximum temperature of 225° F. Other types are available for pressures up to 15,000 psi and temperatures to 750° F.

The free turning qualities of the Emsco ball bearing swivel fittings give them easy

turning at low torque, low resistance to flow and all around safety. The thrust load is taken directly through the center of the balls. The hardened and ground races on which a double row of ball bearings rotate are perpendicular to the lines of force. Packing materials, including Teflon for corrosive and other services, are independent of the ball rows and unaffected by ball race wear. Fittings are available in 500 various types, styles and pipe sizes from 1¼ in. to 4 in.

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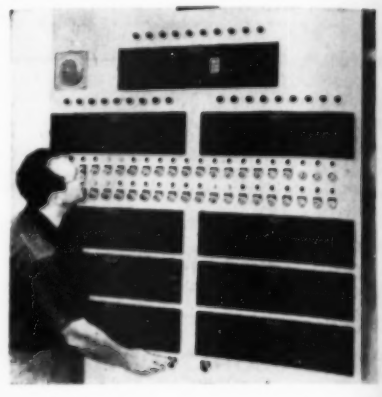

15 Annunciator System

A new type annunciator system automatically indicates the sequence of "off-normal" alarms. Made by Panalarm Products Inc., the visual sequence annunciators can be applied to closely inter-related variables. In this application they pinpoint the cause of trouble by indicating the first variable to go "off-normal" by automatic lock-out of subsequent signals, or by causing the first signal to be red and subsequent signals white. A push-button reset feature is also available which causes the sequence indication to start over. It can be used in compressors and process applications where the cause of trouble is sought, and also on dangerous processes where operators want to be sure the entire process has shut down when trouble occurs.

Alarm signals are grouped for sequential lock-out by simple jumper connections on the rear terminal block, and any number of inter-related groups may be formed or interchanged as desired. All contacts, relays and other moving parts of the Panalarm annunciators are within hermetically sealed plug-in units. Additional signals may be added by addition of plug-in units to the common chassis.

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Cleaner Pipelines Co.

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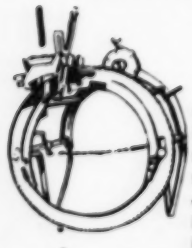

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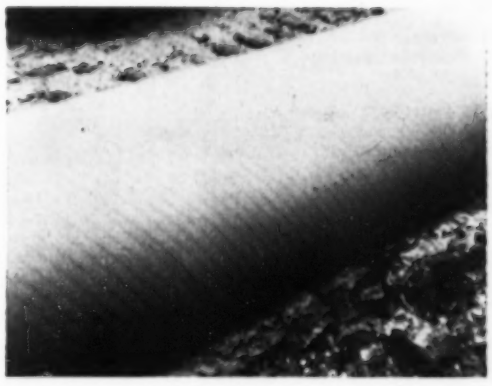

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Pipeline People

ROBERT M. MOORE has been elected vice president of sales of the Pittsburgh Coke & Chemical Co., Pittsburgh. He has been general manager in charge of sales for the last seven years.

R. M. Moore
Pittsburgh Coke

W. E. Mueller
Colorado Interstate

ROBERT W. HENDEE, 58, for 10 years president of Colorado Interstate Gas Co., Colorado Springs, has resigned. He will remain as a member of the board of directors, serving as a consultant to company management. He also plans to establish an office offering consulting services to other gas companies. Mr. Hendee is succeeded by W. E. MUELLER, who joined Interstate in 1952 as executive vice president. He was formerly senior vice president of the Tennessee Gas Transmission Co., Houston. Also resigning from Interstate's management group is W. R. BEARDSLEY, vice president in charge of gas sales. He has been with the company 25 years, working up from the position of gas measurement engineer.

MARSHALL WILLIS, El Paso Natural Gas Co., has been awarded the Oil Industry Information Committee's silver award for his "distinguished accomplishments" in behalf of the oil industry's public information program.

PAT MASK, formerly construction superintendent of Somerville Construction Co., Ada, Mich., has been promoted to customer contact man. He is succeeded by ROBERT WAGNER, who will have charge of distribution projects, and O. P. HINER, who will supervise transmission construction.

DAMON HOLDITCH has been appointed assistant superintendent of leasing for the Lone Star Gas Co., Dallas.

The Brazos Oil & Gas Co., Dow Chemical Co. subsidiary, has appointed LESTER B. SWAN executive vice president with headquarters in Houston. Mr. Swan was formerly assistant general manager of Dowell Inc., Tulsa.

ROBERT KINNAIRD, 55, land agent for Tennessee Gas Transmission Co., died of a heart attack at his home in Danville, Ky., recently. He had been ill for about six weeks.